USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with West Virginia Agricultural and Forestry Experiment Station and the Braxton County Commission

Soil Survey of Braxton County, West Virginia

How to Use This Soil Survey

General Soil Map

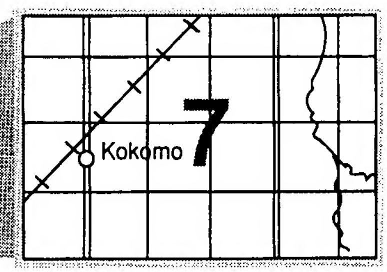
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

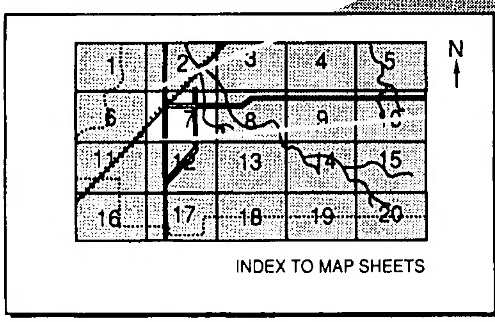
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

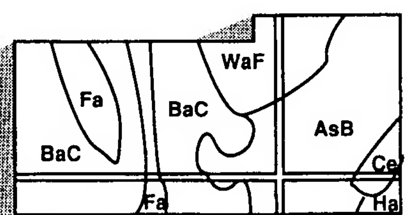


MAP SHEET



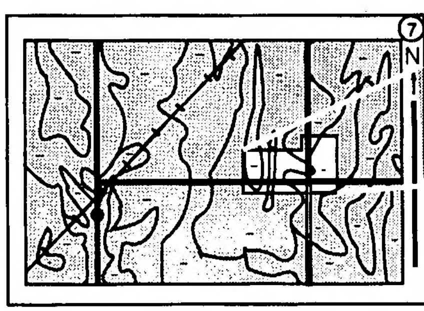
INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.



MAP SHEET

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

An earlier soil survey of Braxton County was included in the Soil Survey of Braxton and Clay Counties, West Virginia, published in 1918 (*5*). This survey updates the earlier report, provides additional information, and includes larger scale maps that show the soil delineations in greater detail.

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service, the West Virginia Agricultural and Forestry Experiment Station, and the Braxton County Commission. The survey is part of the technical assistance furnished to the Elk Soil Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: The nearly level and gently sloping Lobdell and Zoar soils in the foreground are used for hayland. The steep and very steep Gilpin and Upshur soils in the background are used for pasture.

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ISSUED NOVEMBER 1997

Summary of Tables

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of
Braxton County, West Virginia

By Charles H. Delp, Natural Resources Conservation Service

Soil surveying by Charles H. Delp, Robert N. Pate, and George A. Honchar, Natural Resources Conservation Service

Map finishing by D. Paul Amick, Debra Murphy, Linda Handley, and Denise Donelson, West Virginia Map Unit, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
West Virginia Agricultural and Forestry Experiment Station and the Braxton County Commission

Braxton County is situated in the central part of West Virginia (fig. 1). The county has a total area of 330,700 acres, or 517 square miles, of which 2,975 acres is water.

The population of Braxton County in 1980 was 13,894. Sutton, the county seat, had a population of 1,192 in 1980, making it the second largest city in the survey area. Gassaway, the largest city in the county, had a population of 1,225 in 1980 (*14*). The major enterprises in the county are timber and sawmill operations, coal mining, farming, and businesses associated with recreational facilities. The two major recreational areas in the county are Sutton and Burnsville Lakes. Each of these facilities provides more than 13,000 acres that are open to the public for boating, hunting, fishing, camping, picnicking, and hiking.

Transportation in the county is over I-79, US 19, State Routes 4 and 5, and numerous county highways. The county has an airport and a railroad.

This soil survey updates the survey of Braxton and Clay Counties, West Virginia, published in 1918, regarding Braxton County (*6*). It provides additional information and has larger maps, which show the soils in greater detail.

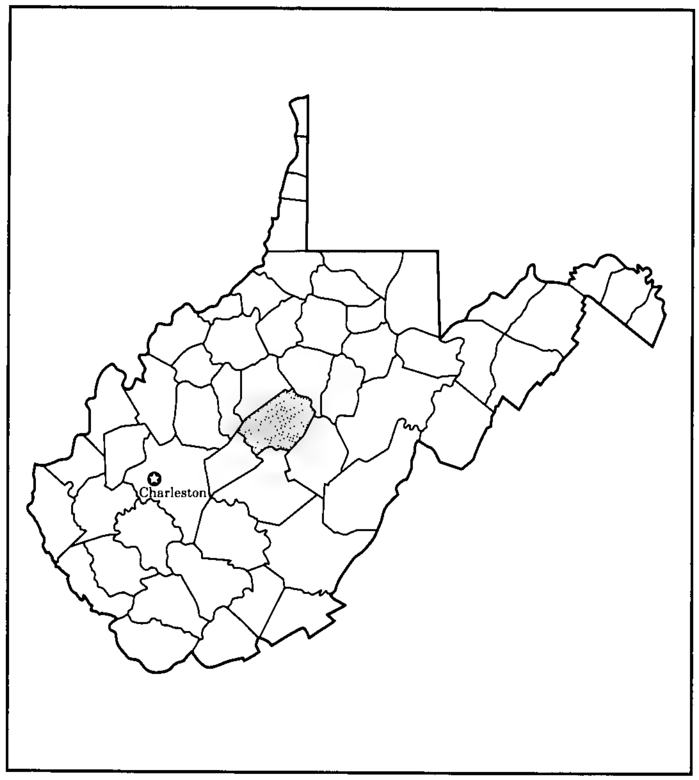

Figure 1.—Location of Braxton County in West Virginia.

General Nature of the County

This section describes the settlement, farming, relief and drainage, geology, and climate of Braxton County.

Settlement

The first settlement in what is now Braxton County was made by the Carpenter family at the mouth of Holly River about 1789-90. Braxton County was formed from Nicholas, Lewis, and Kanawha Counties in 1836. It was named in honor of Carter Braxton, a signer of the Declaration of Independence. Sutton, the county seat, was named for John D. Sutton, who owned the land where the town now stands. By act of assembly, it was originally established as Suttonville on January 27, 1826, and later changed to Sutton on March 1, 1837 (*5*).

Farming

The 1987 Census of Agriculture reported 318 farms in Braxton County and a total farm acreage of 69,838 (*12*). The total number of farms had decreased from 385 since 1982, but the average farm size was 220 acres, an increase from 205 acres in 1982.

The main farm enterprises in the county are beef cattle, sheep, and hogs and the production of hay, pasture, corn, and some truck crops. About 44 acres is in orchards. Most farms are part-time operations.

According to the 1970 West Virginia Soil and Water Conservation Needs Inventory (*9*), cropland took in 31,981 acres and pasture, 55,874 acres. By 1987, cropland decreased to 24,935 acres and, as the trend continues, more farmland is reverting to woodland.

Relief and Drainage

Braxton County is in two major land resource areas, the Central Allegheny Plateau and the Eastern Allegheny Plateau and Mountains (*11*).

The Central Allegheny Plateau occupies the western four-fifths of the county. The topography consists of nearly level to moderately steep ridgetops and steep or very steep side slopes. Much of the area consists of a series of benches on side slopes that are commonly cleared and used for hay and pasture. Elevation in this area of the county ranges from 760 feet at the Elk River on the Braxton-Clay County line to more than 1,700 feet on the ridgetops.

The Eastern Allegheny Plateau and Mountains occupy the eastern fifth of the county. The topography consists of some nearly level bottoms along streams and nearly level to moderately steep ridgetops, but mostly of very steep, rugged side slopes used for timber production. Elevation in this area of the county ranges from about 1,000 feet on the valley floor to 2,160 feet at the summit of the high knob in the southeast edge of the county.

The northern half of the county is drained by the Little Kanawha River. The southern half of the county is drained by the Elk River.

Geology

Gordon Bayles, state geologist, Natural Resources Conservation Service, helped to prepare this section.

In Braxton County, the surface rocks, with the exception of the Quaternary deposits along the valley floors of the larger streams, are of the Permian and Pennsylvanian Periods of the Paleozoic Era (*13*). All the outcrops consist of sedimentary rocks, which show little local folding or disturbance. The strata dip northwest at 87 feet to the mile (*5*).

The northwestern third of the county is characterized by interbedded sandstone, siltstone, red and gray shales, and coal of the Monongahela Formation (*11*). The ridgetops in the extreme northern part of the county near Burnsville are capped by the Dunkard Formation, which is similar to the Monongahela Formation. The Pittsburgh coal is mined commercially in this part of the county. Outcrops of the Conemaugh Formation that follow drainageways can be seen on the lower part of the hillsides.

The central part of the county is made up of interbedded red and gray shales, sandstone, siltstone, and coal of the Conemaugh Formation (fig. 2). Bakerstown coal is the only seam that is mined commercially. Exposed rocks of the Allegheny Formation follow the Elk River drainageway and can be seen on the steep hillsides above the river.

The Dunkard, Monongahela, and Conemaugh Formations have been the parent material for Gilpin, Upshur, and Vandalia soils, the dominant soils in these parts of the county.

The southeastern part of the county is made up of interbedded sandstone, siltstone, shale, and coal of the Allegheny and Kanawha Formations (fig. 3). Kittanning coal is mined commercially in this part of the county. This part of the county has a higher percentage of sandstone bedrock exposed at the surface and in general the topography of the area is more rugged.

The Allegheny and Kanawha Formations provide the parent material for Buchanan, Gilpin, and Lily soils, the dominant soils in the southeastern part of the county.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Gassaway, West Virginia, in the period 1951-81. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 35 degrees F and

Figure 2.—A road cut through the Mahoning sandstone of the Conemaugh Formation, which forms the cliffs of the Little Kanawha River.

the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred on January 18, 1977, is -16 degrees. In summer, the average temperature is 72 degrees and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on September 3, 1953, is 105 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 45.5 inches. Of this, 25 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 22 inches. The heaviest 1-day rainfall during the period of record was 3.76 inches on September 13, 1991. Thunderstorms occur on about 44 days each year, and most occur in summer.

The average seasonal snowfall is about 29 inches. The greatest snow depth at any one time during the period of record was 20 inches. On the average, 15 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about

Figure 3.—Freeport sandstone of the Allegheny Formation, which forms the falls of the Little Kanawha River.

55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 9 miles per hour, in spring.

Heavy rains, which occur at any time of the year, and severe thunderstorms in summer, sometimes cause flash flooding, particularly in narrow valleys.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and

miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Areas of the general soil map join with Lewis, Nicholas, and Webster Counties, West Virginia. The differences in map unit names and in proportions of component soils resulted from differences in map scale and the degree of generalization.

Soil Descriptions

1. Gilpin-Upshur-Vandalia

Strongly sloping to very steep, well drained soils; on uplands and foot slopes

This map unit consists of rolling ridgetops and very steep side slopes broken, in most areas, by a series of benches. The side slopes grade into moderately steep and steep foot slopes and nearly level, narrow flood plains. The side slopes and foot slopes are highly dissected by many, small intermittent streams. In some areas rock outcrops, dominantly sandstone stones and boulders, are common. Slope ranges from 15 to 70 percent.

This map unit makes up about 66 percent of the county. It is about 39 percent Gilpin soils, 25 percent Upshur soils, 10 percent Vandalia soils, and 26 percent soils of minor extent.

Gilpin soils are moderately deep, well drained, and strongly sloping to very steep. They are on ridgetops, side slopes, and benches. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. They have a very dark grayish brown, medium textured surface layer and a strong brown, medium or moderately fine textured subsoil that is channery in the lower part.

Gilpin and Upshur soils are in intermingled areas on the landscape and are generally mapped together as a complex.

Upshur soils are deep, well drained, and strongly sloping to very steep. They are on ridgetops, side slopes, and benches. They formed in material weathered from soft, clayey shale. Upshur soils have a dark brown, medium textured surface layer and a red, fine textured subsoil. They are highly susceptible to slippage.

Vandalia soils are very deep, well drained, and strongly sloping to steep. They are on foot slopes. They formed in colluvial material that moved downslope mainly from Gilpin and Upshur soils. Vandalia soils have a dark brown, medium textured surface layer and a reddish brown, fine textured subsoil that is channery in the lower part. They are highly susceptible to slippage.

The soils of minor extent in this map unit are the well drained Lily soils on ridgetops and benches; the well drained Chavies, Craigsville, and Sensabaugh soils on high flood plains; the moderately well drained Lobdell soils and the well drained Chagrin, Pope, and Sensabaugh soils on narrow flood plains.

Most of this map unit consists of rough, very steep areas that are woodland. About 25 percent of this unit has been cleared and is used for pasture or cropland. Ridgetops, benches, foot slopes, and bottom land are generally used for hay, corn, and pasture; the steeper side slopes are used for woodland production.

Most farms are managed for the production of sheep and hogs, but mostly beef cattle. Ridgetops, foot slopes, and bottom land are generally suitable for the production of hay and row crops; the benches on side slopes are suitable for pasture. Erosion control is a major management concern. Conservation tillage on cropland and rotational grazing on pasture help to control erosion.

The soils in this map unit are suitable for trees. Slope and slippage restrict the use of equipment in these areas.

Erosion on logging roads and skid trails is a management concern. Laying out the roads and trails close to the contour helps to control erosion.

The limitations for community development are slope, stones and boulders on the surface, and depth to bedrock on the Gilpin soils; slope, stones and boulders on the surface, slow permeability, high shrink-swell potential, and slippage on the Upshur soils; slope, stones on the surface, slow permeability, high shrink-swell potential, and slippage on the Vandalia soils; and slope, depth to bedrock, the seasonal high water table, and flooding on the soils of minor extent.

2. Gilpin-Buchanan-Lily

Strongly sloping to very steep, well drained and moderately well drained soils; on uplands and foot slopes

This map unit consists of soils on moderately steep ridgetops that have very steep, rugged side slopes mostly in the eastern part of the county. The side slopes grade into steep foot slopes and nearly level flood plains. Rock outcrops dominated by sandstone and stones are common on the surface. Slope ranges from 15 to 70 percent.

This map unit makes up about 20 percent of the survey area. It is about 75 percent Gilpin soils, 10 percent Buchanan soils, 4 percent Lily soils, and 11 percent soils of minor extent.

Gilpin soils are moderately deep, well drained, and strongly sloping to very steep. They are on ridgetops and side slopes. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a very dark grayish brown, medium textured surface layer and a strong brown, medium or moderately fine textured subsoil that is channery in the lower part.

Buchanan soils are very deep, moderately well drained, moderately steep and steep. They are on foot slopes. They formed in acid material that has moved downslope from soils on uplands. Buchanan soils have a very dark grayish brown, medium textured surface layer and a yellowish brown, medium textured subsoil that is mottled in the lower part. A strong brown, very firm fragipan is at a depth of about 2 feet.

Lily soils are moderately deep, well drained, and strongly sloping to steep. They are on ridgetops. They formed in acid material weathered from sandstone. Lily soils have a dark yellowish brown, medium textured surface layer and a yellowish brown, medium textured subsoil.

The soils of minor extent in this map unit are well drained Allegheny soils and moderately well drained Monongahela and Zoar soils on terraces; well drained Chavies, Sensabaugh, and Craigsville soils on high flood plains; and well drained Pope, Chagrin, and Sensabaugh soils and moderately well drained Lobdell soils on low flood plains.

Most of this map unit is used as woodland and for recreation. Some of the ridgetops and bottom land have been cleared and are used for hay, pasture, and row crops.

Most farms are managed for the production of beef cattle and for woodland. Ridgetops and bottom land are generally suitable for the production of hay, row crops, and pasture. Erosion control is a major management concern. Practicing conservation tillage on cropland and rotational grazing on pasture can help to control erosion.

The soils in this map unit are suitable for trees. Slope and rock outcrop restrict the use of equipment for timber production. Erosion on logging roads and skid trails is a major management concern. Laying out roads and trails close to the contour helps to control erosion.

The limitations for community development are slope, stones on the surface, and depth to bedrock on Gilpin soils; slope, the seasonal high water table, slow permeability, and stones on the surface on Buchanan soils; slope and depth to bedrock on Lily soils; and the seasonal high water table and flooding on soils of minor extent.

3. Buchanan-Chavies-Pope

Steep to nearly level, moderately well drained and well drained soils; on foot slopes and flood plains

This map unit consists of soils on steep foot slopes and nearly level flood plains along the Elk, Little Kanawha, Holly, Birch, and Little Birch Rivers. Slope ranges from 0 to 35 percent.

This map unit makes up about 7 percent of the county. It is about 70 percent Buchanan soils, 5 percent Chavies soils, 5 percent Pope soils, and 20 percent soils of minor extent.

Buchanan soils are very deep, moderately well drained, and moderately steep and steep. They are on foot slopes. They formed in acid material that moved downslope from soils on uplands. Buchanan soils have a very dark grayish brown, medium textured surface layer and a yellowish brown, medium textured subsoil that is mottled in the lower part. A strong brown, very firm fragipan layer is at a depth of about 2 feet.

Chavies soils are very deep, well drained, and nearly level. They are on high flood plains. They formed in alluvial material washed from acid soils on uplands. Areas below the Sutton and Burnsville Dams are protected from flooding. Chavies soils have a dark brown, medium or moderately coarse textured surface layer and a strong brown, medium or moderately coarse textured subsoil.

Pope soils are very deep, well drained, and nearly level. They are on low flood plains. They formed in alluvial

material washed from acid soils on uplands. Pope soils have a dark grayish brown, moderately coarse textured surface layer and a yellowish brown, moderately coarse textured subsoil.

The soils of minor extent in this map unit are well drained Allegheny soils and moderately well drained Monongahela and Zoar soils on terraces and well drained Craigsville soils on high flood plains.

About 75 percent of this unit is used as woodland. Most of the bottom land has been cleared and is used for hay and some row crops. Many areas on the bottom land have been converted to residential housing and commercial use. This unit is dominantly used for the production of woodland, building site development, and recreation.

The farms in this unit are managed for the production of beef cattle and woodland. Bottom lands are generally suitable for the production of hay, row crops, and pasture. Some of the foot slopes have been cleared and are used for pasture and hayland. Erosion control is a major management concern. Cover crops and conservation tillage on cropland and rotational grazing on pasture can help to control erosion.

The soils in this map unit are suitable for trees. Erosion control on logging roads and skid trails is a major management concern for timber production. Laying out roads and trails close to the contour helps to control erosion.

The limitations for community development are slope, the seasonal high water table, slow permeability, and stones on the surface on Buchanan soils; flooding on Chavies and Pope soils; and the seasonal high water table, slow permeability, and flooding on soils of minor extent.

4. Vandalia-Chavies-Pope

Steep to nearly level, well drained soils; on foot slopes and flood plains

This map unit consists of strongly sloping to steep foot slopes that grade into nearly level, high flood plains and low flood plains that are both adjacent to streams. Slope ranges from 0 to 35 percent.

This map unit makes up about 1 percent of the county. It is about 57 percent Vandalia soils, 20 percent Chavies soils, 6 percent Pope soils, and 17 percent soils of minor extent.

Vandalia soils are very deep, well drained, and strongly sloping to steep. They are on foot slopes. They formed in colluvial material that moved downslope mainly from Gilpin and Upshur soils. Vandalia soils have a dark brown, medium textured surface layer and a reddish brown, fine textured subsoil that is channery in the lower part. They are highly susceptible to slippage.

Chavies soils are very deep, well drained, and strongly sloping to steep. They are on high flood plains. They formed in alluvial material washed from acid soils on uplands. Areas below the Burnsville Dam are protected from flooding. Chavies soils have a dark brown, medium or moderately coarse textured surface layer and a strong brown, medium or moderately coarse textured subsoil.

Pope soils are very deep, well drained, and nearly level. They are on low flood plains. They formed in alluvial material washed from acid soils on uplands. Pope soils have a dark grayish brown, moderately coarse textured surface layer and a yellowish brown, moderately coarse textured subsoil.

The soils of minor extent in this map unit are the well drained Craigsville and Sensabaugh soils on high flood plains, the well drained Sensabaugh soils on low flood plains, the moderately well drained Lobdell soils on low flood plains, and the moderately well drained Buchanan soils on foot slopes.

About 75 percent of this unit is used as woodland. Most of the bottom land has been cleared and is used for hay and some row crops. Areas of Chavies soils below the Burnsville Dam that are protected from flooding have been converted to residential housing and commercial use. This unit is dominantly used for the production of woodland, building site development, and farming.

The farms in this unit are managed for the production of beef cattle and woodland. Bottom lands are generally suitable for the production of hay, row crops, and pasture. Some of the foot slopes have been cleared and are used for pasture and hayland. Erosion control is a major management concern. Conservation tillage on cropland and rotational grazing on pasture help to control erosion.

The soils in this map unit are suitable for trees. Slope and slippage restrict the use of equipment for timber production. Erosion control on logging roads and skid trails is a major management concern. Laying out roads and trails close to the contour helps to control erosion.

The limitations for community development are slope, stones on the surface, slow permeability, high shrink-swell potential, and slippage on Vandalia soils; flooding on Chavies and Pope soils; and flooding, the seasonal high water table, slow permeability, and slope on soils of minor extent.

5. Gilpin-Upshur-Buchanan

Very steep to strongly sloping, well drained and moderately well drained soils; on uplands and foot slopes

This map unit consists of rolling ridgetops and very steep side slopes that are broken in many areas by a series of benches. The side slopes grade into steep foot slopes and nearly level, narrow flood plains. The side slopes and foot slopes are highly dissected by many small, intermittent streams. Slope ranges from 15 to 70 percent.

This map unit makes up about 4 percent of the survey

area. It is 55 percent Gilpin soils, 20 percent Upshur soils, 15 percent Buchanan soils, and 10 percent soils of minor extent.

Gilpin soils are moderately deep, well drained, and strongly sloping to very steep. They are on ridgetops, side slopes, and benches. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a very dark grayish brown, medium textured surface layer and a strong brown, medium or moderately fine textured subsoil that is channery in the lower part.

Gilpin and Upshur soils are in areas so closely intermingled on the landscape that they are generally mapped together as a complex.

Upshur soils are deep, well drained, and strongly sloping to steep. They are on ridgetops, side slopes, and benches. They formed in material weathered from soft, clayey shale. Upshur soils have a dark brown, medium textured surface layer and a red, fine textured subsoil. They are highly susceptible to slippage.

Buchanan soils are very deep, moderately well drained, and moderately steep and steep. They are on foot slopes. They formed in acid material that moved downslope from soils on uplands. Buchanan soils have a very dark grayish brown, medium textured surface layer and a yellowish brown, medium textured subsoil that is mottled in the lower part. A strong brown, very firm fragipan is at a depth of about 2 feet.

The soils of minor extent in this map unit are the well drained Lily soils on ridgetops, the well drained Allegheny soils and the moderately well drained Monongahela soils on terraces, the well drained Chavies and Craigsville soils on high flood plains, and the well drained Pope soils on low flood plains.

About 85 percent of this unit is used as woodland. Some of the ridgetops and bottom land that have been cleared are used for hay, pasture, and some row crops. The unit is dominantly used for woodland and recreation.

The farms in this unit are managed for the production of beef cattle and woodland. Bottom lands and ridgetops are generally suitable for the production of hay, row crops, and pasture. Some of the foot slopes have been cleared and are used for pasture and hayland. Erosion control is a major management concern. Cover crops and conservation tillage on cropland and rotational grazing on pasture help to control erosion.

The soils in this map unit are suitable for trees. Slope and rock outcrop restrict the use of equipment for timber production. Erosion on logging roads and skid trails is a major management concern. Laying out roads and trails close to the contour helps to control erosion.

The limitations for community development are slope, stones on the surface, and depth to bedrock on Gilpin soils; slope, slow permeability, high shrink-swell potential, and slippage on Upshur soils; slope, seasonal high water table, slow permeability, and stones on the surface on Buchanan soils; and slope, the seasonal high water table, slow permeability, depth to bedrock, and flooding on soils of minor extent.

6. Gilpin-Buchanan-Pineville

Very steep to moderately steep, well drained and moderately well drained soils; on uplands and foot slopes

This map unit consists of soils on very steep side slopes that grade into moderately steep and steep foot slopes in the eastern part of the county. The landscape is characterized by rough mountainous topography. It is a deeply dissected plateau with narrow ridgetops, narrow, winding valleys, and long, very steep side slopes. Slope ranges from 3 to 70 percent.

This map unit makes up about 2 percent of the county. It is about 40 percent Gilpin soils, 25 percent Buchanan soils, 17 percent Pineville soils, and 18 percent soils of minor extent.

Gilpin soils are moderately deep, well drained, and very steep and stony. They are on uplands. They formed in acid material weathered from interbedded shale, siltstone, and sandstone. Gilpin soils have a very dark grayish brown, medium textured surface layer and a strong brown, medium or moderately fine textured subsoil that is channery in the lower part.

Buchanan soils are very deep, moderately well drained, and moderately steep and steep. They are on foot slopes. They formed in acid material that moved downslope from soils on uplands. Buchanan soils have a very dark brown, medium textured surface layer and a yellowish brown, medium textured subsoil that is mottled in the lower part. A strong brown, very firm fragipan layer is at a depth of about 2 feet.

Pineville soils are very deep, well drained, and very steep. They are on mountain side slopes and in coves. They formed in acid material that moved downslope from soils on uplands. Pineville soils have a very dark brown, medium textured surface layer and a yellowish brown, medium textured, channery subsoil.

The soils of minor extent in this map unit are the well drained Lily soils on ridgetops; the well drained Allegheny soils and the moderately well drained Monongahela and Zoar soils on terraces; the well drained Chavies and Craigsville soils on high flood plains; and the well drained Pope soils on low flood plains.

Most of this map unit is used as woodland. Some areas of the flood plain have been cleared and are used for hay, pasture, and row crops. This unit is dominantly used for woodland and recreation.

The farms in this unit are managed mostly for

woodland production. Bottom lands, moderately steep ridgetops, and moderately steep foot slopes are generally suitable for the production of hay, pasture, and row crops; however, nearly all areas on ridgetops and foot slopes are in woodland. Erosion control is a major management concern. Conservation tillage on cropland and rotational grazing on pasture help to control erosion.

The soils in this map unit are suitable for trees. Slope and rock outcrop restrict the use of equipment for timber production. Erosion control on logging roads and skid trails is a major management concern. Laying out roads and trails close to the contour helps to control erosion.

The limitations for community development are slope, stones on the surface, and depth to bedrock on Gilpin soils; slope, the seasonal high water table, slow permeability, and stones on the surface on Buchanan soils; slope and stones on the surface on Pineville soils; and slope, depth to bedrock, the seasonal high water table, slow permeability, and flooding on soils of minor extent.

Detailed Soil Map Units

Dr. John Sencindiver, professor of agronomy, West Virginia Agricultural and Forestry Experiment Station, helped to prepare this section.

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Vandalia silt loam, 8 to 15 percent slopes, is a phase of the Vandalia series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Gilpin-Upshur silt loams, 15 to 25 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of

present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Gilpin-Pineville association, very steep, extremely stony, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

AgB—Allegheny loam, 3 to 8 percent slopes

This soil is very deep and well drained. It is on stream terraces mainly along the Elk, Holly, and Little Kanawha Rivers in the county.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil extends to a depth of 43 inches. The upper 6 inches is yellowish brown clay loam. The next 18 inches is yellowish brown cobbly clay loam and the lower 12 inches is yellowish brown sandy clay loam. The substratum extends to a depth of 65 inches or more. The upper 12 inches is yellowish brown clay loam and the lower l0 inches is strong brown sandy clay loam.

Included with this soil in mapping are a few small areas of the well drained Chavies soils and the moderately well drained Buchanan, Monongahela, and Zoar soils. Also included are a few small areas of soils that have slope of less than 3 percent and a few small areas of soils that have slope of more than 8 percent. Included soils make up about 25 percent of this map unit.

The available water capacity of this Allegheny soil is moderate or high. Permeability is moderate in the subsoil. Runoff is medium and natural fertility is low or moderate. In unlimed areas this soil is very strongly acid or strongly acid. The depth to bedrock is more than 60 inches.

Most areas are used for meadow or pasture. Some areas are used for community development.

This soil is suited to cultivated crops, hay, and pasture. The hazard of erosion is moderate in unvegetated areas and is a management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes and rotational grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Common tree species in this unit include red oak, yellow-poplar, sugar maple, white ash, American elm, red maple, black oak, and white oak. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

Erosion hazard is the main limitation of this soil as a site for dwellings and septic tank absorption fields. Removal of vegetation should be held to a minimum on construction sites to help to control erosion. Establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is IIe.

BuE—Buchanan channery loam, 15 to 35 percent slopes, extremely stony

This soil is very deep and moderately well drained. It is on foot slopes along the base of steeper slopes, on benches, and around drainageways mostly in the eastern and southeastern parts of the county. Stones that are 1 to 2 feet in diameter cover 3 to 15 percent of the surface area of this soil.

Typically, the surface layer is very dark grayish brown channery loam about 1 inch thick. It is underlain by 3 inches of dark brown channery loam. The subsoil extends to a depth of 58 inches. The lower 33 inches of the subsoil is a firm or very firm and brittle layer called a fragipan. It is yellowish brown loam to a depth of 11 inches. It is yellowish brown channery loam to a depth of 18 inches and, to a depth of 25 inches, yellowish brown channery clay loam mottled in grayish brown and light brownish gray. The subsoil, to a depth of 42 inches, is strong brown channery loam mottled in pinkish gray. To a depth of 58 inches it is strong brown channery sandy clay loam mottled in pinkish gray. The substratum is yellowish brown very channery sandy loam mottled in pinkish gray and yellowish red. It extends to a depth of 65 inches or more.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Lily, Pineville, Chavies, Sensabaugh, Chagrin, Pope, and Craigsville soils and the moderately well drained Lobdell soils. Also included are a few small areas of which stones and boulders cover less than 3 percent of the surface, soils where stones and boulders cover more than 15 percent of the surface, soils

where a fragipan is deeper than typical for the Buchanan series, and soils that have slope of more than 35 percent. Included soils make up about 25 percent of this map unit.

The available water capacity of this Buchanan soil is low or moderate. Permeability is moderate above the fragipan and slow in the very firm fragipan in the subsoil. Runoff is rapid or very rapid. Natural fertility is moderate. A seasonal high water table is about 1½ to 3 feet below the surface. This and the fragipan restrict the root zone of deep-rooted plants. In unlimed areas this soil is extremely strongly acid to acid. Depth to bedrock is more than 60 inches.

Most areas are used as woodland. Some areas are cleared and used for pasture or community development.

Because of stones on the surface, this soil is not suited to cultivated crops or hay and cannot be easily managed for pasture. Stones and slope restrict the use of farm machinery. The hazard of erosion is severe in unvegetated areas and is a management concern. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the surface is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, yellow-poplar, black oak, Eastern hemlock, and basswood. Plant competition, the erosion hazard, and the equipment limitation are management concerns.

Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. In some places, large boulders hinder the use of logging equipment and make roads and skid trails difficult to construct. Laying out roads and skid trails close to the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

Slope, the seasonal high water table, and slow permeability in the very firm layer of the subsoil are the main limitations of this soil as a site for dwellings and septic tank absorption fields. In areas where stones and boulders cover 50 percent or more of the surface, excavation and disposition of large rock fragments is difficult. The steep slopes require additional grading for roads, dwellings, and other structures, and lawns are difficult to maintain. Vertical cuts made during road construction and site preparation should be sloped and vegetation established. Sealing foundation walls, installing foundation drains, backfilling with porous material, and using diversions to intercept water from higher areas will help to prevent wet basements. Increasing the area of the septic tank absorption field, placing absorption fields on the contour, and installing diversions to intercept water from higher areas can help to keep effluent from seeping to the surface or backing up in the dwelling. Removal of vegetative cover should be held to a minimum on construction sites to help to control erosion. Establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is VIIs.

Cg—Chagrin silt loam

This soil is very deep and well drained. It is on flood plains of secondary streams in the central and western parts of the county. This soil is subject to occasional flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is brown silt loam that extends to a depth of 35 inches. The substratum extends to a depth of at least 65 inches. It is brown loam to a depth of 45 inches, strong brown loam to a depth of 58 inches, and strong brown gravelly loam to a depth of 65 inches.

Included with this soil in mapping are a few small areas of the well drained Pope and Sensabaugh soils and the moderately well drained Lobdell soils. Also included are a few small areas of soils that are moderately well drained and coarser textured than the Chagrin soil, soils that have more silt and slightly redder colors in the subsoil than the Chagrin soil, and soils that have slope of more than 3 percent. Included soils make up about 20 percent of this map unit.

The available water capacity of this Chagrin soil is high. Permeability is moderate in the subsoil. Runoff is slow. Natural fertility is high. In unlimed areas this soil is moderately acid to neutral. Depth to bedrock is more than 60 inches.

Most areas are used for cultivated crops, meadow, and pasture. Some areas are used for woodland.

This soil is suited to cultivated crops, hay, and pasture. Crops can be grown continuously on this soil, but a cover crop is needed to help to control erosion. Working the residue from the cover crop into the soil helps to maintain soil fertility and tilth. In places crops are subject to damage from flooding. Proper stocking rates to maintain desirable grasses and legumes and rotational grazing are major pasture management needs.

This soil has moderately high potential productivity for trees, but only a small acreage is wooded. Common tree species on this unit include red oak, yellow-poplar, white oak, sugar maple, black cherry, white ash, and black walnut. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

The hazard of flooding is the main limitation of this soil

Figure 4.—Flooding in an area of Chagrin silt loam.

as a site for dwellings and septic tank absorption fields (fig. 4). This soil is unsuited as a site for dwellings and septic tank absorption fields. Selecting a better suited soil is needed to overcome this limitation. If vegetation is removed, establishing plant cover in unprotected areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is IIw.

Ch—Chavies fine sandy loam, rarely flooded

This soil is very deep and well drained. It is on high flood plains mainly along the Elk River above the Sutton Dam, the Little Kanawha River above the Burnsville Dam, and the Holly River. This soil is subject to rare flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 12 inches thick. The subsoil extends to a depth of 36 inches. The upper 18 inches is strong brown loam and the lower 6 inches is strong brown fine sandy loam. The substratum extends to a depth of 65 inches or more. It is strong brown sandy loam.

Included with this soil in mapping are a few small areas of the well drained Allegheny, Craigsville, and Pope soils and the moderately well drained Monongahela and Zoar soils. Also included are a few small areas of soils that are moderately well drained and gravelly throughout the profile and soils that have slope of more than 3 percent. Included soils make up about 15 percent of this map unit.

The available water capacity of this Chavies soil is moderate or high. Permeability is moderately rapid throughout. Runoff is slow. Natural fertility is moderate. In unlimed areas this soil is strongly acid to slightly acid. Depth to bedrock is more than 60 inches.

Most areas of this soil are used for cultivated crops, meadow, or pasture. Some areas are reverting to woodland.

This soil is well suited to cultivated crops, hay, and pasture (fig. 5). Crops can be grown continuously on this

soil, but a cover crop is needed to help control erosion. Working the residue from the cover crop into the soil helps to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes and rotational grazing are major pasture management needs.

This soil has moderately high potential productivity for trees (fig. 6). Common tree species include red oak, sycamore, white oak, yellow-poplar, American sycamore, hickory, red maple, sugar maple, and black cherry. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

The hazard of flooding is the main limitation of this soil as a site for dwellings and septic tank absorption fields. Protecting the soil from flooding or choosing a more suitable soil is needed to overcome this limitation. Establishing plant cover in unprotected areas and providing proper surface water disposal will help to control erosion and sedimentation.

The capability class is I.

Cp—Chavies fine sandy loam, protected

This soil is very deep and well drained. It is on high flood plains along the Elk River below the Sutton Dam and along the Little Kanawha River below the Burnsville Dam. These U.S. Army Corps of Engineers structures protect these soils from flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 12 inches thick. The subsoil extends to a depth of 36 inches. The upper 18 inches is strong brown loam and the lower 6 inches is strong brown fine sandy loam. The substratum extends to a depth of 65 inches or more. It is strong brown sandy loam.

Figure 5.—Chavies fine sandy loam, rarely flooded, in the foreground is used for meadow, and Gilpin-Pineville association, very steep, extremely stony, in the background is used for woodland.

Figure 6.—Pole size stand of yellow poplar along the Holly River in an area of Chavies fine sandy loam, rarely flooded.

Included with this soil in mapping are a few small areas of the well drained Allegheny, Craigsville, and Pope soils and the moderately well drained Monongahela and Zoar soils. Also included are a few small areas of soils that are moderately well drained and gravelly throughout the profile and soils that have slope of more than 3 percent. Included soils make up about 15 percent of this map unit.

The available water capacity of this Chavies soil is moderate or high. Permeability is moderately rapid throughout. Runoff is slow. Natural fertility is moderate. In unlimed areas this soil is strongly acid to slightly acid. Depth to bedrock is more than 60 inches.

Most areas are used for cultivated crops, hay, pasture, and community development. Some areas are used as woodland.

This soil is well suited to cultivated crops, hay, and pasture. Crops can be grown continuously on this soil, but a cover crop is needed to help to control erosion. Working the residue from the cover crop into the soil helps to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes and rotational grazing are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species include red oak, hickory, red maple, sycamore, white oak, black cherry, black walnut, sugar maple, and yellow-poplar. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

This soil has been protected from flooding by major flood control structures. It has no major limitations as a site for dwellings and septic tank absorption fields (fig. 7). Although unlikely, flooding is possible if the flood control structure should fail. Establishing plant cover on unvegetated areas and providing proper surface water disposal help to control erosion and sedimentation.

The capability class is I.

Cr—Craigsville gravelly sandy loam

This soil is very deep and well drained. It is on high flood plains and on alluvial fans at the mouth of hollows in the eastern and southeastern part of the county. This soil is subject to rare flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer is dark brown gravelly sandy loam about 6 inches thick. The subsoil extends to a depth of 35 inches. It is dark yellowish brown very cobbly loam to a depth of 12 inches. It is yellowish brown very gravelly sandy loam to a depth of 19 inches. It is yellowish brown extremely cobbly sandy loam to a depth of 35 inches. The substratum extends to a depth of 65 inches or more. It is yellowish brown extremely cobbly loamy sand.

Included with this soil in mapping are a few small areas of the well drained Chavies, Pope, and Sensabaugh soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils that consist of 70 to 90 percent pebbles and cobbles in the profile. Also included are areas of soils that are similar to this Craigsville soil but that are not subject to flooding. Included soils make up about 15 percent of this map unit.

The available water capacity of this Craigsville is very low to high. Permeability is moderately rapid in the subsoil. Runoff is slow. Natural fertility is moderate. In unlimed areas this soil is very strongly acid or strongly acid. Depth to bedrock is more than 60 inches.

Most areas of this soil are wooded. Some areas are used for hay or pasture.

This soil is suited to cultivated crops, hay, or pasture. Droughtiness during dry seasons is a major management concern. Cover crops, conservation tillage, a crop sequence that includes hay, and working the residue from the cover crop into the soil helps to improve the moisture holding capacity and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing during dry seasons are major pasture management needs.

This soil has moderately high potential productivity for

Figure 7.—A housing development in an area of Chavies fine sandy loam, protected.

trees. Common tree species include yellow-poplar, red oak, white oak, sycamore, white pine, Virginia pine, black oak, scarlet oak, chestnut oak, and hickory. Plant competition is the major management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

The hazard of flooding is the main limitation of this soil as a site for dwellings. This soil is generally not suited as a site for dwellings unless protected from flooding. The hazard of flooding and moderately rapid permeability in the subsoil are the main limitations of this soil as a site for septic tank absorption fields. Protecting the soil from flooding or selecting a more suitable soil is needed to overcome the limitations. This map unit commonly includes soils not subject to flooding that can be identified by an onsite investigation. The included soils may have fewer limitations for dwellings and septic tank absorption fields. Establishing plant cover on unvegetated areas and providing proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIs.

GaF—Gilpin silt loam, 35 to 70 percent slopes, very stony

This soil is moderately deep and well drained. It is on hillsides mostly in the eastern and southeastern part of the county. Stones 1 to 2 feet in diameter cover 1 to 3 percent of the surface of this soil.

Typically, the surface layer is very dark grayish brown silt loam about 1 inch thick. It is underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. It is yellowish brown silt loam to a depth of 7 inches. It is strong brown channery silty clay loam to a depth of 24 inches. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of 31 inches.

Included with this soil in mapping are a few small areas of the well drained Lily, Pineville, and Upshur soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where rock fragments make up more than 35 percent of the volume of the profile, areas where stones and boulders cover from 15 to 75 percent of the surface, areas of rock outcrops, and areas of soils that have slope of less than 35 percent. Included soils make up about 25 percent of this map unit.

The available water capacity of this Gilpin soil is moderate. Permeability is moderate in the subsoil. Runoff is very rapid. Natural fertility is moderate. In unlimed areas this soil is extremely acid to strongly acid. Depth to bedrock ranges from 20 to 40 inches.

Nearly all areas of this soil are wooded. A few areas are used for pasture.

Because of stones on the surface, this soil is not suited to cultivated crops, hay, or pasture. Stones, slope, and rock outcrops restrict the use of farm machinery. The severe erosion hazard in unprotected areas is a major management concern.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, scarlet oak, Virginia pine, chestnut oak, and yellow-poplar. Plant competition, the equipment limitation, and erosion control are major management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Seedling mortality on southern exposures is a limitation because they are drier sites and have less water available to seedlings. Planting desirable species that are adaptable to the soil conditions of this unit, planting seedlings at the proper time of the year, and planting in adequate numbers is needed to establish a desirable stand. Using equipment that is adapted to the slopes, placing roads and skid trails near the contour, diverting surface water from the roads, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks will help to overcome equipment limitations and to control erosion. Where present, rock outcrops make construction of roads very difficult and impose a severe limitation on logging equipment.

The soil is not suited to urban uses and is better suited to woodland or wildlife uses. The very steep slopes and depth to bedrock are the main limitations. If the soil is disturbed, establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is VIIs.

GIC—Gilpin-Lily complex, 8 to 15 percent slopes

This map unit consists of moderately deep, well drained soils on ridgetops mostly in the eastern and southeastern parts of the county. The soils in this complex are so intermingled that it was not practical to map them separately at the scale selected for mapping. The complex is about 40 percent Gilpin silt loam, 35 percent Lily loam, and 25 percent other soils.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 28 inches. The upper 4 inches is dark yellowish brown silt loam. The lower 17 inches is yellowish brown silty clay loam. The substratum is yellowish brown channery loam that extends to interbedded sandstone and shale bedrock at a depth of 34 inches.

Typically, the surface layer of the Lily soil is dark yellowish brown loam about 6 inches thick. The subsoil extends to a depth of 23 inches. The upper 4 inches is yellowish brown loam and the next 9 inches is yellowish brown clay loam. The lower 4 inches is strong brown clay loam. The substratum is strong brown channery clay loam that extends to sandstone bedrock at a depth of 27 inches.

Included with these soils in mapping are a few small areas of the well drained Pineville, Upshur, and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones and boulders cover as much as 3 percent of the surface, areas of soils where slope is less than 8 percent, and areas of soils that range from 15 to 25 percent slope. Included soils make up about 25 percent of this map unit.

The available water capacity is moderate in both soils. Permeability in the subsoil is moderate in the Gilpin soil and moderately rapid in the Lily soil. Runoff is rapid and natural fertility is moderate in both soils. In unlimed areas, these soils are strongly acid to extremely acid. Depth to bedrock ranges from 20 to 40 inches in both soils.

Most areas are used as woodland. Some areas are cleared and are used as meadow or pasture.

These soils are suited to cultivated crops, hay, and pasture. The hazard of erosion is severe in unvegetated areas and is a management concern. If this soil is cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until these soils are reasonably firm are major pasture management needs.

These soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, chestnut oak, scarlet oak, Virginia pine, and yellow-poplar. Plant competition, the equipment limitation, and erosion control are management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

Slope and depth to bedrock are the main limitations of these soils as a site for dwellings and septic tank absorption fields. In some areas of the Gilpin soil, bedrock, even though generally rippable, limits excavations. In places it is hard sandstone. Building on the bedrock and landscaping with additional fill will help to overcome the depth to bedrock limitation. Selecting areas of the deepest soils, installing the absorption fields on the contour, and planning for a larger absorption field will help to overcome the depth to bedrock limitation for septic tank absorption fields. Minimizing removal of vegetative cover on construction sites helps to control erosion. Establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is IIIe.

GlD—Gilpin-Lily complex, 15 to 25 percent slopes

This map unit consists of moderately deep, well drained soils on ridgetops mainly in the eastern and southeastern parts of the county. The soils in this complex are so intermingled that it was not practical to map them separately at the scale selected for mapping. This unit is about 50 percent Gilpin silt loam, 30 percent Lily loam, and 20 percent other soils.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 6 inches thick. The subsoil extends to a depth of 26 inches. The upper 4 inches is dark yellowish brown silt loam. The lower 16 inches is yellowish brown silty clay loam. The substratum is yellowish brown channery loam that extends to interbedded sandstone and shale bedrock at a depth of about 32 inches.

Typically, the surface layer of the Lily soil is dark yellow brown loam about 6 inches thick. The subsoil extends to a depth of 23 inches. The upper 4 inches is yellowish brown loam. The next 9 inches is yellowish brown clay loam. The lower 4 inches is strong brown clay loam. The substratum is strong brown channery clay loam that extends to sandstone bedrock at a depth of 27 inches.

Included with these soils in mapping are small areas of the well drained Pineville, Upshur, and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface and areas of soils where slope ranges from 3 to 15 percent or from 25 to 35 percent. Included soils make up about 20 percent of this map unit.

The available water capacity is moderate in both soils. Permeability in the subsoil is moderate in the Gilpin soil and moderately rapid in the Lily soil. Runoff is rapid and natural fertility is moderate in both soils. In unlimed areas these soils are extremely acid to strongly acid. Depth to bedrock ranges from 20 to 40 inches in both soils.

Most areas are used as woodland. Some areas are cleared and are used as meadow or pasture.

These soils have limited suitability for cultivated crops and are better suited to hay and pasture. The hazard of

erosion is severe in unvegetated areas and is a management concern. If these soils are cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, maintaining shallow drainageways in sod, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and good tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until these soils are reasonably firm are major pasture management needs.

These soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, scarlet oak, chestnut oak, Virginia pine, and yellow-poplar. Plant competition, the equipment limitation, and erosion control are management concerns. On south aspects, seedling mortality is a management concern because they are drier sites and have less water available to seedlings. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

The depth to bedrock and slope are the main limitations of these soils as a site for dwellings and septic tank absorption fields. In some areas of the Gilpin soil, bedrock, even though generally rippable, limits excavations. In places, it is hard sandstone. The steep slopes require additional grading for roads, dwellings, and other structures, and lawns are difficult to maintain. Building on the bedrock and landscaping with additional fill will help to overcome the depth to bedrock. Selecting areas of less sloping soils and conforming dwelling design to the landscape help to overcome slope for dwellings. Selecting areas of the deepest and less sloping soils, installing the absorption field on the contour, and planning for a larger absorption field will help to overcome the depth to bedrock and slope for septic tank absorption fields. Minimizing removal of vegetative cover on construction sites helps to control erosion. Establishing plant cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IVe.

GIE—Gilpin-Lily complex, 25 to 35 percent slopes

This map unit consists of moderately deep, well drained soils on ridgetops mainly in the eastern and southeastern parts of the county. The soils in this complex are so intermingled that it was not practical to map them separately at the scale selected for mapping. This unit is about 60 percent Gilpin silt loam, 20 percent Lily loam, and 20 percent other soils.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 1 inch thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. The upper 4 inches is yellowish brown silt loam. The lower 17 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of about 31 inches.

Typically, the surface layer of the Lily soil is very dark gray loam about 1 inch thick underlain by 1 inch of dark brown loam. The subsoil extends to a depth of 34 inches. The upper 11 inches is yellowish brown loam. The next 12 inches is yellowish brown channery clay loam, and the lower 9 inches is yellowish brown channery loam. The substratum is yellowish brown channery loam that extends to sandstone bedrock at a depth of 39 inches.

Included with these soils in mapping are small areas of the well drained Pineville, Upshur, and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones and boulders cover as much as 3 percent of the surface, areas of rock outcrop, areas of soils where rock fragments make up more than 35 percent of the volume and areas of soils that have slope of 15 to 25 percent or more than 35 percent. Included soils make up about 20 percent of this map unit.

The available water capacity is moderate in both soils. Permeability in the subsoil is moderate in the Gilpin soil and moderately rapid in the Lily soil. Runoff is very rapid. Natural fertility is moderate in both soils. In unlimed areas, these soils are extremely acid to strongly acid. The depth to bedrock ranges from 20 to 40 inches in both soils.

Nearly all of these soils are used as woodland. A few areas are used as meadow or pasture.

The soils in this unit are not suited to cultivated crops or hay, but are suited to pasture. The severe erosion hazard in unprotected areas and overgrazing of pasture are major management concerns. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soils are reasonably firm are major pasture management needs.

These soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, scarlet oak, chestnut oak, Virginia pine, and yellow-poplar. Plant competition, the equipment limitation, and erosion control are management concerns. On south aspects, seedling mortality is a management concern because the soils, being drier, have less water available to seedlings. Intensive management to keep undesirable plants from competing with native

plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

The depth to bedrock and slope are the main limitations of these soils as a site for dwellings and septic tank absorption fields. These soils are not suited to most urban uses. Selecting alternate sites of soils with fewer limitations should be considered. If vegetation on these soils is disturbed, establishing plant cover and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is VIe.

GuC—Gilpin-Upshur silt loams, 8 to 15 percent slopes

This map unit consists of moderately deep and deep, well drained soils on ridgetops in the central and western part of the county. The soils in this unit are so intermingled that it was not practical to map them separately at the scale selected for mapping. The map unit is about 35 percent Gilpin silt loam, 35 percent Upshur silt loam, and 30 percent other soils.

The surface layer of the Gilpin soil is typically dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 28 inches. The upper 4 inches is dark yellowish brown silt loam. The lower 17 inches is yellowish brown silty clay loam. The substratum is yellowish brown channery loam that extends to interbedded sandstone and shale at a depth of about 34 inches.

The surface layer of the Upshur soil is typically dark brown silt loam about 2 inches thick. The subsoil extends to a depth of 32 inches. The upper 3 inches is reddish brown silty clay loam, and the next 9 inches is red clay. The next 14 inches is weak red clay. The lower 4 inches is weak red silty clay. The substratum is weak red very channery silty clay loam that extends to red and olive shale at a depth of 43 inches.

Included with these soils in mapping are small areas of the well drained Lily and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of soils that have slope of 3 to 8 percent or 15 to 25 percent, and areas of soils where erosion has removed more than 75 percent of the topsoil. Included soils make up about 30 percent of this map unit.

The available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. Permeability in the subsoil is moderate in the Gilpin soil and slow in the Upshur soil. Runoff is rapid for both soils. Natural fertility is moderate in the Gilpin soil and moderate or high in the Upshur soil. In unlimed areas, the Gilpin soil is extremely acid to strongly acid. In unlimed areas, the Upshur soil is very strongly acid or strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soil and 40 to 60 inches in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil and is highly susceptible to land slips.

Most of these soils are used for meadow or pasture. Some areas are used for woodland and community development.

These soils are suited to cultivated crops, hay, and pasture. The hazard of erosion is severe in unvegetated areas and is a management concern. If these soils are cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soils are reasonably firm are major pasture management needs.

These soils have moderate or moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, chestnut oak, black oak, scarlet oak, Virginia pine, and yellow-poplar. Plant competition is a management concern on both soils. On the Upshur soil, during wet seasons poor traction and low soil strength restrict the use of equipment. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

The depth to bedrock is the main limitation of the Gilpin soil as a site for dwellings and septic tank absorption fields (fig. 8). In some areas of the Gilpin soil, bedrock, even though generally rippable, limits excavations. In places, it is hard sandstone. Building on the bedrock and landscaping with additional fill help to overcome the depth to bedrock. Selecting areas of deep soils and planning for a large absorption field help to overcome the limitations of the Gilpin soil for septic tank absorption fields.

Slow permeability, high shrink-swell potential in the subsoil, and slippage are the main limitations of the Upshur soil as a site for dwellings and septic tank absorption fields. Backfilling with porous material and using wide, reinforced footers with adequate drainage help to overcome the limitations for dwellings. Selecting areas of less clayey soils and planning for a large absorption field will help to overcome the slow permeability limitation

Figure 8.—Depth to bedrock is a limitation of the Gilpin soil on Gilpin-Upshur soil loams, 8 to 15 percent slopes.

of Upshur soils for septic tank absorption fields. Minimizing removal of vegetative cover on construction sites helps to control erosion. Establishing plant cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIIe.

GuD—Gilpin-Upshur silt loams, 15 to 25 percent slopes

This map unit consists of moderately deep and deep, well drained soils on ridgetops and benches in the central and western parts of the county. The benches are commonly dissected by drainageways and land slips occur in places. The soils in this unit are so intermingled that it was not practical to map them separately at the scale selected for mapping. The unit is about 45 percent Gilpin silt, 30 percent Upshur silt loam, and 25 percent other soils.

Typically, the surface layer of the Gilpin soil is dark grayish brown silt loam about 2 inches thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 26 inches. The upper 4 inches is yellowish brown silt loam. The lower 18 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of about 32 inches.

Typically, the surface layer of the Upshur soil is dark brown silt loam about 2 inches thick. The subsoil extends to a depth of 32 inches. The upper 3 inches is reddish brown silty clay loam. The next 9 inches is red clay, and

the next 14 inches is weak red clay. The lower 4 inches of the subsoil is weak red silty clay. The substratum is weak red very channery silty clay loam that extends to red and olive shale at a depth of 43 inches.

Included with these soils in mapping are small areas of the well drained Lily and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of soils where slope ranges from 8 to 15 percent or from 25 to 35 percent, and areas of soils where more than 75 percent of the topsoil has been eroded. Included soils make up about 25 percent of this map unit.

The available water capacity is moderate in the Gilpin soil and moderate or high in the Upshur soil. Permeability in the subsoil is moderate in the Gilpin soil and slow in the Upshur soil. Runoff is rapid for both soils. Natural fertility is moderate in the Gilpin soil and moderate or high in the Upshur soil. In unlimed areas, Gilpin soils are extremely acid to strongly acid. In unlimed areas, Upshur soils are very strongly acid or strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soil and from 40 to 60 inches in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil and is highly susceptible to land slips.

These soils are equally divided between areas used for woodland and areas used for meadow or pasture.

The soils in this map unit have limited suitability for cultivated crops and are better suited to hay and pasture (fig. 9). The hazard of erosion is severe in unvegetated areas and is a management concern. If these soils are cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, maintaining shallow drainageways in sod, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper

Figure 9.—Pasture in an area of Gilpin-Upshur silt loams, 15 to 25 percent slopes.

stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soils are reasonably firm are major pasture management needs.

Gilpin and Upshur soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, scarlet oak, Virginia pine, and yellow-poplar. Erosion control, the equipment limitation, and plant competition are management concerns. On the Upshur soil, during wet seasons poor traction and low soil strength restrict the use of equipment. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

Slope and depth to bedrock are the main limitations of the Gilpin soil as a site for dwellings and septic tank absorption fields. On the Gilpin soil, the bedrock, even though it is generally rippable, may hinder excavations. In places, it is hard sandstone. Building on the bedrock and landscaping with additional fill will help to overcome the depth to bedrock. Selecting areas of deeper and less sloping soils, installing the absorption field on the contour, and planning for a larger absorption field help to overcome the limitations of the Gilpin soil for septic tank absorption fields.

Slope, slow permeability, high shrink-swell potential in the subsoil, and slippage are the main limitations of the Upshur soil as a site for dwellings and septic tank absorption fields. Selecting areas of less sloping soils, designing dwellings to fit the landscape, backfilling with porous material, and using wide reinforced footers with adequate drainage will help to overcome the limitations for dwellings. Selecting areas of less clayey soils and planning for a large absorption field will help to overcome the slow permeability of the Upshur soil. Minimizing the removal of vegetative cover on construction sites helps to control erosion. Establishing plant cover in unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is IVe.

GuE—Gilpin-Upshur silt loams, 25 to 35 percent slopes

This map unit consists of moderately deep and deep, well drained soils on hillsides, benches, and narrow ridgetops in the central and western parts of the county. The hillsides and benches are commonly dissected by drainageways and land slips occur in places. The soils in this complex are so intermingled that it was not practical to map them separately at the scale selected for mapping. The map unit is about 35 percent Gilpin silt loam, 35 percent Upshur silt loam, and 30 percent other soils.

Typically, the surface layer of the Gilpin soil is very dark grayish brown silt loam about 1 inch thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. The upper 4 inches is yellowish brown silt loam. The lower 17 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of 31 inches.

The surface layer of the Upshur soil is typically dark brown silt loam about 2 inches thick. The subsoil extends to a depth of 30 inches. The upper 3 inches is reddish brown silty clay loam. The next 9 inches is red clay. The next 12 inches is weak red clay, and the lower 4 inches is weak red silty clay. The substratum is weak red very channery silty clay loam that extends to red and olive shale at a depth of 43 inches.

Included with these soils in mapping are a few small areas of the well drained Lily and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of rock outcrops, areas of soils that have slope of 15 to 25 percent or more than 35 percent, and areas of soils where more more than 75 percent of the topsoil has been eroded. Included soils make up about 30 percent of this map unit.

The available water capacity is moderate in the Gilpin soil and moderate or high in the Upshur soil. Permeability in the subsoil is moderate in the Gilpin soil and slow in the Upshur soil. Runoff is very rapid for both soils. Natural fertility is moderate in the Gilpin soil and moderate or high in the Upshur soil. In unlimed areas, the Gilpin soil is extremely acid to strongly acid. In unlimed areas, the Upshur soil is very strongly acid or strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soil and from 40 to 60 inches in the Upshur soil. The Upshur soil has high shrink-swell potential in the subsoil and is highly susceptible to land slips.

Most of these soils are used for woodland. Some areas are used for pasture.

The soils in this map unit are not suited to cultivated crops or hay, but are suited to pasture. The severe erosion hazard in unvegetated areas and overgrazing of pasture are major management concerns. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soils are reasonably firm are major pasture management needs.

The Gilpin and Upshur soils have moderately high

potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, scarlet oak, Virginia pine, and yellow-poplar. Erosion control, the equipment limitation, and plant competition are major management concerns. On the Upshur soil, during wet seasons poor traction and low soil strength restrict the use of equipment. The Upshur soil is highly susceptible to slippage. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

Slope and depth to bedrock are the main limitations of the Gilpin soil as site for dwellings and septic tank absorption fields. Slope, slow permeability, high shrink-swell in the subsoil, and slippage are the main limitations of the Upshur soil. These soils are not suited to most urban uses. Selecting alternate sites of soils with fewer limitations is needed. If vegetation on these soils is disturbed, establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is VIe.

GuF—Gilpin-Upshur silt loams, 35 to 70 percent slopes

This map unit consists of moderately deep and deep, well drained soils on hillsides in the central and western parts of the survey area. The hillsides are commonly dissected by drainageways and land slips occur in places. The soils in this map unit are so intermingled that it was not practical to map them separately at the scale selected for mapping. The map unit is about 50 percent Gilpin silt loam, 30 percent Upshur silt loam, and 20 percent other soils.

Typically, the surface layer of the Gilpin soil is very dark grayish brown silt loam about 1 inch thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. The upper 4 inches is yellowish brown silt loam. The lower 17 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of 31 inches.

Typically, the surface layer of the Upshur soil is dark brown silt loam about 2 inches thick. The subsoil extends to a depth of 30 inches. The upper 3 inches is reddish brown silty clay loam. The next 9 inches is red clay. The next 12 inches is weak red clay and the lower 4 inches is weak red silty clay. The substratum is weak red very channery silty clay loam that extends to red and olive shale at a depth of 43 inches.

Included with these soils in mapping are a few small areas of the well drained Lily and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of rock outcrops, areas of soils that have slope of less than 35 percent, and areas of soils where more than 75 percent of the topsoil has been eroded. Included soils make up about 20 percent of this map unit.

The available water capacity is moderate in the Gilpin soil and moderate to high in the Upshur soil. Permeability in the subsoil is moderate in the Gilpin soil and slow in the Upshur soil. Runoff is very rapid for both soils. Natural fertility is moderate in the Gilpin soil and moderate or high in the Upshur soil. In unlimed areas, the Gilpin soil is extremely acid to strongly acid. In unlimed areas, the Upshur soil is very strongly acid or strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soil and from 40 to 60 inches in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil and is highly susceptible to land slips.

Nearly all areas of these soils are in woodland. A few areas are used for pasture.

The soils in this map unit are not suited to cultivated crops, hay, or pasture. Slope restricts the use of farm machinery. The severe erosion hazard on unvegetated areas is a major management concern.

The Gilpin and Upshur soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, chestnut oak, scarlet oak, black oak, Virginia pine, and yellow-poplar. Erosion control, the equipment limitation, and plant competition are major management concerns. On the Upshur soil, during wet seasons poor traction and low soil strength restrict the use of equipment. The Upshur soil is highly susceptible to slippage. Intensive management to keep undesirable plants from competing with native plants on planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

These soils are not suited to urban uses and are better suited to woodland or wildlife uses. The very steep slopes and depth to bedrock are the main limitations of the Gilpin soil. The very steep slopes, slow permeability, high shrink-swell in the subsoil, and slippage are the main limitations of the Upshur soil (fig. 10). If vegetation on these soils is disturbed, establishing plant cover in unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is VIIe.

Figure 10.—A landslip in an area of Gilpin-Upshur silt loams, 35 to 70 percent slopes.

GxF—Gilpin-Upshur silt loams, 35 to 70 percent slopes, extremely bouldery

This map unit consists of moderately deep and deep, well drained soils on hillsides in the central and western parts of the county. The hillsides are commonly dissected by drainageways and land slips occur in places. The soils in this map unit are so intermingled that it was not practical to map them separately at the scale selected for mapping. In this map unit boulders mostly 2 to 10 feet in diameter cover from 3 to 15 percent of the surface. The unit is about 70 percent Gilpin silt loam, 20 percent Upshur silt loam, and 10 percent other soils.

Typically, the surface layer of the Gilpin soil is very dark grayish brown silt loam about 1 inch thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. The upper 4 inches is yellowish brown silt loam. The lower 17 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale at a depth of 31 inches.

Typically, the surface layer of the Upshur soil is dark brown silt loam about 2 inches thick. The subsoil extends to a depth of 30 inches. The upper 3 inches is reddish brown silty clay loam. The next 9 inches is red clay. The next 12 inches is weak red clay, and the lower 4 inches is weak red silty clay. The substratum is weak red very channery silty clay loam that extends to red and olive shale at a depth of 43 inches.

Included with these soils in mapping are a few small areas of the well drained Lily and Vandalia soils and the

moderately well drained Buchanan soils. The Vandalia and Buchanan soils are found on small benches and drainageways intermingled with the steeper areas. Also included are a few small areas of soils where stones cover from 15 to 75 percent of the surface, areas of sandstone rock outcrops that are 10 to 40 feet in height, areas of soils that have slope of less than 35 percent, areas of soils that are less than 20 inches deep over bedrock, a few areas of escarpments, and areas of soils where erosion has removed much of the original surface layer and the subsoil is exposed in places. Included soils make up about 25 percent of this map unit.

The available water capacity is moderate in the Gilpin soil and moderate or high in the Upshur soil. Permeability in the subsoil is moderate in the Gilpin soil and slow in the Upshur soil. Runoff is very rapid for both soils. Natural fertility is moderate in the Gilpin soil and moderate or high in the Upshur soil. In unlimed areas, the Gilpin soil is extremely acid to strongly acid. In unlimed ares, the Upshur soil is very strongly acid or strongly acid in the surface layer and strongly acid to mildly alkaline in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soil and from 40 to 60 inches in the Upshur soil. The Upshur soil has a high shrink-swell potential in the subsoil and is highly susceptible to land slips.

Nearly all of these soils are used for woodland.

The soils in this map unit are not suited to cultivated crops, hay, or pasture. In some areas, rock outcrops as much as 40 feet in height prevent traversing this unit with machinery. The severe erosion hazard on unvegetated areas is a major management concern.

Gilpin and Upshur soils have moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, chestnut oak, scarlet oak, and yellow-poplar. The more desirable tree species and higher quality trees are generally found in small drainageways and on benches. Erosion control, the equipment limitation, and plant competition are management concerns. The use of equipment is restricted on the Upshur soil during wet seasons because it is soft and slippery when wet and is highly susceptible to slippage. The accessibility of some areas is extremely difficult because of rock outcrops and boulders (fig. 11). Also, escarpments as much as 40 feet in height prevent the construction of logging roads and skid trails. In places, these rock outcrops continue on a contour across the unit for several hundred feet. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion.

These soils are not suited to urban uses and are better suited to woodland or wildlife uses. The very deep slopes and depth to bedrock are the main limitations of the Gilpin soil. The very steep slopes, slow permeability, high shrink-swell potential in the subsoil, and slippage are the main limitations of the Upshur soil. In some areas, stones, boulders, and rock outcrops are also limitations for both the Gilpin and Upshur soils. If vegetation on these soils is disturbed, establishing plant cover in unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is VIIs.

GZF—Gilpin-Pineville association, very steep, extremely stony

This map unit consists of moderately deep and very deep, well drained soils on mountain side slopes in the eastern part of the county. Areas of the individual soils are large enough to map separately but, considering the present and predicted use, they were mapped as one unit. Dominant slope ranges from 35 to 70 percent. Stones 1 to 2 feet in diameter cover 3 to 15 percent of the surface. The Gilpin soils are typically on convex, upper and middle slopes. The Pineville soils are typically on concave, upper and lower side slopes. This map unit is about 50 percent Gilpin soils, 25 percent Pineville soils, and 25 percent soils of minor extent.

Typically, the surface layer of the Gilpin soils is very dark grayish brown silt loam about 1 inch thick underlain by 2 inches of dark brown silt loam. The subsoil extends to a depth of 24 inches. The upper 4 inches is yellowish brown silt loam. The lower 17 inches is strong brown channery silty clay loam. The substratum is strong brown channery silt loam that extends to interbedded sandstone and shale bedrock at a depth of 31 inches.

Typically, the surface layer of the Pineville soils is very dark brown loam about 5 inches thick. The subsoil extends to a depth of 60 inches. The upper 5 inches is dark yellowish brown channery loam. The next 21 inches is yellowish brown channery loam. The lower 29 inches is yellowish brown very channery loam. The substratum is yellowish brown very channery loam that extends to a depth of 65 inches.

Included with these soils in mapping are small areas of the well drained Lily soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils that have a thick, dark surface layer and more than 35 percent rock fragments, by volume, in the profile, small areas of soils where stones and boulders cover more than 15 percent of the surface, and small areas of rock outcrops. Included soils make up about 25 percent of this map unit.

Figure 11.—Vertical sandstone outcrops on Gilpin-Upshur silt loams, 35 to 70 percent slopes, extremely bouldery.

The available water capacity is moderate in the Gilpin soils and moderate or high in the Pineville soils. Permeability in the subsoil is moderate in both soils. Runoff is very rapid. Natural fertility is moderate in both soils. In unlimed areas, the Gilpin soils are extremely acid to strongly acid. The Pineville soils are strongly acid to slightly acid in the surface layer and very strongly acid or strongly acid in the subsoil and substratum. The depth to bedrock ranges from 20 to 40 inches in the Gilpin soils and is more than 65 inches in the Pineville soils.

Nearly all areas of these soils are in woodland. Some areas have been disturbed by cut and fill operations because of small exploratory operations for coal.

The soils in this association are not suited to cultivated crops, hay, or pasture. The major limitations are the very steep slopes and a severe erosion hazard.

The soils in this association have moderately high potential productivity for trees. Common tree species on this unit include white oak, northern red oak, black oak, basswood, and yellow-poplar. Plant competition, erosion control, and the equipment limitation are major management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. Seedling mortality on the Pineville soils is an additional management concern. Planting desirable species that are adaptable to the soil conditions of this map unit, planting seedlings at the proper time of the year, and planting in

adequate numbers is needed to establish a desirable stand. Placing roads and skid trails near the contour, diverting surface water from the roads, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks help to control erosion. Where present, rock outcrops make construction of roads very difficult and are a severe limitation on logging equipment. On slopes of more than 55 percent, conventional skidder logging techniques are not recommended. Specialized equipment or management techniques adapted to steep slopes are needed in harvesting.

These soils are not suited to urban uses. They are better suited to woodland and wildlife uses. The very steep slopes and depth to bedrock are the main limitations of the Gilpin soils. The very steep slope is the main limitation of the Pineville soils. If the soil is disturbed, establishing plant cover in unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is VIIs.

Lo—Lobdell silt loam

This soil is very deep and moderately well drained. It is on the flood plains of secondary streams in the central and western parts of the county.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 32 inches. The upper 10 inches is strong brown silt loam and the lower 14 inches is brown loam mottled with pinkish gray. The substratum extends to a depth of at least 65 inches. The upper 23 inches is brown loam mottled with pinkish gray and the lower 10 inches is mixed light olive brown, strong brown, and gray sandy clay loam.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Pope, Sensabaugh, and Vandalia soils. Also included are a few small areas of soils that are poorly drained, soils that have slightly redder colors in the subsoil than the Lobdell soil, and soils that have slope of more than 3 percent. Included soils make up about 20 percent of this map unit.

The available water capacity of this Lobdell soil is high. Permeability is moderate in the subsoil. Runoff is slow. Natural fertility is high. In unlimed areas, this soil is moderately acid to neutral. Depth to bedrock is more than 60 inches.

Most areas of this soil are used for cultivated crops, meadow, or pasture. A few areas are used for woodland.

This soil is suited to cultivated crops, hay, and pasture. Crops can be grown continuously on this soil but a cover crop is needed to help to control erosion. Working the residue from the cover crop into the soil helps to maintain soil fertility and tilth. In places, crops are subject to damage from flooding. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, American sycamore, white oak, white ash, black cherry, and yellow-poplar. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

Flooding and wetness are the main limitations of this soil as a site for dwellings and septic tank absorption fields (fig. 12). Alternate sites could be selected to overcome these limitations. If vegetation is removed, establishing plant cover in unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIw.

MgB—Monongahela silt loam, 3 to 8 percent slopes

This soil is very deep and moderately well drained. It is on stream terraces along the major streams and rivers in the county.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 58 inches. The upper 14 inches is strong brown clay loam. The lower 34 inches of the subsoil is a firm and brittle fragipan. It is strong brown clay loam mottled with pinkish gray. The substratum to a depth of 65 inches is strong brown silty clay loam mottled with pinkish gray.

Included with this soil in mapping are a few small areas of the well drained Allegheny and Chavies soils and the moderately well drained Zoar soils. Also included are a few small areas of soils that do not have a firm and brittle layer but are moderately well drained and areas of soils that have slope of less than 3 percent or more than 8 percent. Included soils make up about 25 percent of this map unit.

The available water capacity of this Monongahela soil is moderate. Permeability is moderate above the fragipan and moderately slow or slow in the very firm, fragipan layer of the subsoil. Runoff is medium. Natural fertility is moderate. This soil has a seasonal high water table about 1½ to 3 feet below the surface; this and the fragipan restrict the root zone of deep-rooted plants. In unlimed areas, this soil is very strongly acid or strongly acid. Depth to bedrock is more than 60 inches.

Most areas are used for meadow, pasture, or community development.

This soil is suited to cultivated crops, hay, or pasture. The hazard of erosion is moderate in unvegetated areas

Figure 12.—Flooding is a major limitation to urban uses on Lobdell silt loam.

and is a management concern. Conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes and rotational grazing are major pasture management needs.

This soil has moderately high potential productivity for trees. Only a small acreage is wooded.

The seasonal high water table is the main limitation of this soil as a site for dwellings. Sealing foundation walls, installing foundation drains, backfilling with porous material, and using diversions to intercept water from high areas help to prevent wet basements. The seasonal high water table and moderately slow or slow permeability are the main limitations of this soil as a site for septic tank absorption fields. Increasing the area of the septic tank absorption field, placing absorption fields on the contour, and installing diversions to intercept water from higher areas help to keep effluent from seeping to the surface or backing up in the dwelling. Removal of vegetation should be held to a minimum on construction sites to help to control erosion. Establishing plant cover on unvegetated areas and providing proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIe.

MyE—Myra channery clay loam, steep, very stony

This soil is very deep and well drained. It occurs on upland side slopes and benches that have been disturbed by surface mining activities. This soil is concentrated in the northern part of the county near the community of Copen. Stones that are 1 to 2 feet in diameter cover 1 to 3 percent of the surface. Slope ranges mainly from 25 to 35 percent.

Typically, the surface layer is dark yellowish brown, channery clay loam about 6 inches thick. The substratum

extends below a depth of 65 inches. The upper 31 inches is yellowish brown very channery clay loam that has gray, lithochromic mottles. The lower 28 inches is reddish brown very stony clay loam that has gray, lithochromic mottles.

Included with this soil in mapping are a few small areas of the well drained Gilpin, Pope, Upshur, and Vandalia soils and the moderately well drained Buchanan soils. Also included are a few small areas of soils that have been disturbed by surface mine operations and that have high acidity; areas of soils where stones or boulders cover as much as 50 percent of the surface; small areas of mine refuse dumps; small, wet depressions; areas of surface mined soils that have vertical highwalls that range from 10 to 100 feet in height; and areas of mine soils that have slope of less than 25 percent. Included soils make up about 20 percent of this map unit.

The available water capacity of this Myra soil is low to high. Permeability is moderately slow or moderate. Runoff is very rapid. Natural fertility is moderate or high. This soil is slightly acid to moderately alkaline. Depth to bedrock is more than 60 inches.

Most areas of this soil have been seeded to sericea lespedeza, fescue, birdsfoot trefoil, and black locust. Most areas have been reverting to woodland. A few areas are used for pasture (fig. 13). Gas wells are common on the nearly level to gently sloping benches.

This very stony soil is not suited to cultivated crops or hay and cannot be easily managed for pasture. Stones and slope restrict the use of farm machinery. The hazard of erosion is severe in unvegetated areas and is a management concern. Proper stocking rates to maintain grasses and legumes, rotational grazing, application of fertilizer, and deferred grazing in spring until the surface of this soil is reasonably firm are major pasture management needs.

This very stony soil has moderately high potential productivity for trees. It is suited to both conifers and deciduous trees, and most areas are reverting to woodland. Planted tree species commonly include black locust, Virginia pine, and eastern white pine. Species that are naturally invading this map unit include yellow-poplar, sweetgum, black cherry, and American sycamore. Most areas do not have trees large enough for harvesting. Seedling mortality is a management concern. Planting adequate numbers of healthy seedlings that are adaptable to the soil conditions and planting at the proper time of year are needed to establish a desirable stand. Growth of tree seedlings may be slow because of competition from grasses and legumes.

Steep slopes and surface and subsurface stones and boulders are the main limitations of the Myra soil as a site for dwellings and septic tank absorption fields. Other potential problems include slippage and subsidence. Onsite investigation and testing is needed for determining soil limitations and the potential for urban uses.

The capability subclass is VIIs.

Po—Pope sandy loam

This soil is very deep and well drained. It is on flood plains along the Elk, Holly, and Little Kanawha Rivers and their major tributaries. This soil is subject to occasional flooding. Slope ranges from 0 to 3 percent.

Typically, the surface layer is dark grayish brown sandy loam about 5 inches thick. The subsoil extends to a depth of 40 inches. The upper 3 inches is dark yellowish brown sandy loam. The next 14 inches is yellowish brown sandy loam and the lower 18 inches is dark yellowish brown sandy loam. The substratum extends to a depth of at least 65 inches. The upper 12 inches is yellowish brown sandy loam. The next 6 inches is yellowish brown sandy clay loam. The lower 7 inches is yellowish brown loamy sand.

Included with this soil in mapping are a few small areas of the well drained Allegheny, Chagrin, Chavies, Craigsville, and Sensabaugh soils and the moderately well drained Buchanan, Lobdell, and Monongahela soils. Also included are a few small areas of soils that have pebbles and cobbles throughout 70 percent or more of the profile. Included soils make up about 15 percent of this map unit.

The available water capacity of this Pope soil is moderate or high. Permeability in the subsoil is moderate or moderately rapid. Runoff is slow. Natural fertility is low. In unlimed areas, this soil is extremely acid to strongly acid. Depth to bedrock is more than 60 inches.

Most areas are used for meadow, pasture, or cultivated crops. A few areas are used for woodland.

This soil is suited to cultivated crops, hay, or pasture. Crops can be grown continuously on this soil, but a cover crop is needed to help to control erosion. Working the residue from the cover crop into the soil helps to maintain soil fertility and tilth. In places, crops are subject to damage from flooding. Proper stocking rates to maintain desirable grasses and legumes and rotational grazing are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, American sycamore, basswood, blackgum, white oak, Eastern hemlock, American beech, and yellow-poplar. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

The hazard of flooding is the main limitation of this soil as a site for dwellings and septic tank absorption fields. Alternative sites could be selected to overcome this limitation. If vegetation is removed, establishing plant

Figure 13.—Meadow and pasture on an area of Myra channery clay loam, steep, very stony.

cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIw.

SoA—Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded

This soil is very deep and well drained. It is on flood plains along secondary streams and their tributaries.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 29 inches. The upper 13 inches is brown loam. The lower 9 inches is brown gravelly clay loam. The substratum extends to a depth of at least 65 inches. The upper 9 inches is brown very gravelly sandy clay loam, and the lower 27 inches is brown very gravelly loam.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Craigsville, Pope, and Vandalia soils and the moderately well drained Buchanan and Lobdell soils. Also included are a few small areas of soils that are poorly drained, soils that are subject to rare flooding, and soils that have slope greater than 3 percent. Included soils make up about 20 percent of this map unit.

The available water capacity of this Sensabaugh soil is moderate or high. Permeability is moderate or moderately rapid in the subsoil. Runoff is slow. Natural fertility is high. In unlimed areas, this soil is slightly acid to neutral. Depth to bedrock is more than 60 inches.

Most areas of this soil are used for meadow, pasture, or cultivated crops (fig. 14). A few areas are used for woodland.

This soil is suited to cultivated crops, hay, and pasture. Crops can be grown continuously on this soil but a cover crop is needed to help to control erosion. Working the

residue from the cover crop into the soil helps to maintain soil fertility and tilth. In places, crops are subject to damage from flooding. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, Virginia pine, sycamore, white oak, and yellow-poplar. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

The hazard of flooding is the main limitation of this soil as a site for dwellings and septic tank absorption fields. Alternate sites could be selected to overcome this limitation. If vegetation is removed, establishing plant cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIw.

SrB—Sensabaugh silt loam, 3 to 8 percent slopes, rarely flooded

This soil is very deep and well drained. It is on alluvial fans and high flood plains.

Typically, the surface layer is dark yellowish brown silt

Figure 14.—Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded, in the foreground, is used for meadow, and Vandalia silt loam, 15 to 25 percent slopes, in the background, is used for meadow and pasture.

loam about 7 inches thick. The subsoil extends to a depth of 29 inches. The upper 13 inches is brown loam. The lower 9 inches is brown gravelly clay loam. The substratum extends to a depth of 29 to 65 inches. The upper 9 inches is brown very gravelly sandy clay loam, and the lower 27 inches is brown very gravelly loam.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Craigsville, Pope, and Vandalia soils and the moderately well drained Buchanan and Lobdell soils. Also included are a few small areas of soils that have slope of less than 3 percent or more than 8 percent, areas of soils that are poorly drained, and areas of soils that are like the Sensabaugh soil but that are not subject to flooding. Included soils make up about 20 percent of this map unit.

The available water capacity of this Sensabaugh soil is moderate or high. Permeability is moderate or moderately rapid in the subsoil. Runoff is medium. Natural fertility is high. In unlimed areas, this soil is slightly acid to neutral. Depth to bedrock is greater than 60 inches.

Most areas of this soil are used for meadow, pasture, or cultivated crops. A few areas are used for woodland.

This soil is suited to cultivated crops, hay, and pasture. The hazard of erosion is moderate in unprotected areas and is a management concern. If this soil is cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. In places, crops are subject to damage from flooding. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, sycamore, Virginia pine, and yellow-poplar. Plant competition is a management concern. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand.

The rare hazard of flooding is the main limitation of this soil as a site for dwellings and septic tank absorption fields. Protecting the soil from flooding or choosing a more suitable soil help to overcome the limitation. Onsite investigation can help to locate soils that are not subject to flooding and that have fewer limitations. If vegetation is removed, establishing plant cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIe.

Ud—Udorthents, smoothed

This nearly level to very steep, well drained soil is mostly in areas that have been disturbed by road construction and earth moving associated with mining activities. It is located throughout the county. Slope ranges from 0 to 70 percent.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The substratum extends to a depth greater than 65 inches. The upper 17 inches is brown, dark grayish brown, and strong brown loam. The next 13 inches is brown, yellowish brown, and strong brown loam. The lower 30 inches is brown and brownish yellow loam.

Included with this soil in mapping are a few small areas of the well drained Gilpin and Pineville soils. Also included are a few small areas that have been covered with concrete or asphalt. Included soils make up about 20 percent of this map unit.

It is impractical to estimate the physical and chemical properties of this unit because of its disturbed nature and high variability. However, most fill areas are more than 60 inches to bedrock. Runoff ranges from slow on nearly level areas to very rapid on very steep areas. Natural fertility is generally low.

This map unit is not used for cultivated crops, hay, pasture, or woodland. Some areas have been seeded to sericea lespedeza, orchardgrass, and fescue to help to control erosion and sedimentation. Trees that naturally invade this unit include yellow-poplar, sycamore, and birch.

Because of its extreme variability, an onsite investigation is necessary to determine the suitability of this unit for any proposed use. If vegetative cover is removed, establishing plant cover in unprotected areas and providing for proper surface water disposal can help to control erosion and sedimentation.

This unit is not assigned to a capability subclass.

VaC—Vandalia silt loam, 8 to 15 percent slopes

This soil is very deep and well drained. It is on foot slopes along the base of steeper slopes and around the head of drainageways in most parts of the county.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of 52 inches. The upper 5 inches is reddish brown silt loam. The next 15 inches is reddish brown channery silty clay loam. The lower 26 inches is reddish brown channery silty clay. The substratum extends to a depth of at least 65 inches. It is reddish brown very channery silty clay.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Gilpin, Lily, Sensabaugh, and Upshur soils and the moderately well drained Lobdell and Zoar soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of soils that have slope of 3 to 8 percent or 15 to 25 percent, and areas of soils where more than 75 percent of the topsoil has been eroded. Included soils make up about 25 percent of this map unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability in the subsoil is moderately slow or slow. Runoff is rapid. Natural fertility is medium or high. In unlimed areas, this soil is moderately acid to very strongly acid in the solum and strongly acid to slightly acid in the substratum. Depth to bedrock is more than 60 inches.

Most areas are used for pasture or meadow. Some areas are used for woodland.

This soil is suited to cultivated crops, hay, and pasture. The hazard of erosion is severe in unvegetated areas and is a management concern. If this soil is cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, Virginia pine, American beech, and yellow-poplar. Plant competition and erosion control are management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. The use of equipment is restricted during the wet seasons because of poor traction and low soil strength. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

High shrink-swell potential in the subsoil, slow permeability in the subsoil, and slippage are the main limitations of this soil for dwellings and septic tank absorption fields. Backfilling with porous material and using wide, reinforced footers with adequate drainage help to overcome the limitations for dwellings. Planning for a larger absorption field and selecting areas of less clayey soils help to overcome the slow permeability for septic tank absorption fields. Minimizing the removal of vegetative cover helps to control erosion. Establishing plant cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIIe.

VaD—Vandalia silt loam, 15 to 25 percent slopes

This soil is very deep and well drained. It is on foot slopes along the base of steeper slopes and around the head of drainageways in most parts of the county.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of 52 inches. The upper 5 inches is reddish brown silt loam. The next 15 inches is reddish brown channery silty clay loam. The lower 26 inches is reddish brown channery silty clay. The substratum extends to a depth of at least 65 inches. It is reddish brown very channery silty clay.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Gilpin, Lily, Sensabaugh, and Upshur soils and the moderately well drained Lobdell and Zoar soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of soils that have slope of 8 to 15 percent or 25 to 35 percent, and a few small areas of soils where more than 75 percent of the topsoil has been eroded. Included soils make up about 25 percent of this map unit.

The available water capacity of this Vandalia soil is moderate or high. Permeability in the subsoil is slow or moderately slow. Runoff is rapid. Natural fertility is medium or high. In unlimed areas, this soil is moderately acid to very strongly acid in the solum and strongly acid to slightly acid in the substratum. Depth to bedrock is more than 60 inches.

This soil is equally divided between areas used for woodland and those used for meadow or pasture.

This soil has limited suitability for cultivated crops and is better suited to hay and pasture. The hazard of erosion is severe in unvegetated areas and is a management concern. If this soil is cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, maintaining shallow drainageways in sod, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, Virginia pine, hickory, American beech, and yellow-poplar. Plant competition, the

Figure 15.—Country road slipping away on Vandalia silt loam, 15 to 25 percent slopes.

equipment limitation, and erosion control are management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. The use of equipment is restricted during the wet seasons because of poor traction and low soil strength. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

Slope, high shrink-swell potential in the subsoil, slow permeability in the subsoil, and slippage are the main limitations for dwellings and septic tank absorption fields. Landslips are a common problem along roads (fig. 15). Steep slopes require additional grading for roads, dwellings, and other structures, and lawns are difficult to maintain. Selecting areas of less sloping soils, designing dwellings to fit the landscape, backfilling with porous material, and using wide reinforced footers with adequate drainage help to overcome the slope, high shrink-swell potential, and slippage for dwellings. Selecting areas of less sloping soils, installing the absorption fields on the contour, planning for a larger field, and selecting areas of less clayey soils help to overcome the slope and slow permeability for septic tank absorption fields. Removal of vegetative cover should be held to a minimum on construction sites. Establishing plant cover on unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IVe.

VaE—Vandalia silt loam, 25 to 35 percent slopes

This soil is very deep and well drained. It is on foot slopes along the base of steeper slopes and around the head of drainageways in most parts of the county.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of 52 inches. The upper 5 inches is reddish brown silt loam. The next 15 inches is reddish brown channery silty clay loam. The lower 26 inches is reddish brown channery silty clay. The substratum extends to a depth of at least 65 inches. It is reddish brown very channery silty clay.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Gilpin, Lily, Sensabaugh, and Upshur soils and the moderately well drained Lobdell and Zoar soils. Also included are a few small areas of soils where stones cover as much as 3 percent of the surface, areas of soils that have slope of 15 to 25 percent or more than 35 percent, and a few small areas of soils where more than 75 percent of the topsoil has been eroded and the subsoil is exposed in places. Included soils make up about 25 percent of this map unit.

The available water capacity is moderate or high. Permeability in the subsoil is slow or moderately slow. Runoff is very rapid. Natural fertility is medium or high. In unlimed areas, this soil is moderately acid to very strongly acid in the solum and strongly acid to slightly acid in the substratum. Depth to bedrock is more than 60 inches.

Most areas are used for woodland. Some areas are used for meadow or pasture.

This soil is not suited to cultivated crops or hay, but it is suited to pasture. The severe hazard of erosion in unvegetated areas and overgrazing of pasture are major management concerns. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak, white oak, black oak, Virginia pine, American beech, and yellow-poplar. Plant competition, the equipment limitation, and erosion control are management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. The use of equipment is restricted during the wet seasons because of poor traction and low soil strength. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

Slope, high shrink-swell potential in the subsoil, slow permeability in the subsoil, and slippage are the main limitations for dwellings and septic tank absorption fields. This soil is not suited to most urban uses. Selecting alternate sites of soils with fewer limitations should be considered for dwellings and septic tank absorption fields. If vegetation on this soil is removed, establishing plant cover on unvegetated areas and providing for proper surface water disposal can help to control erosion and sedimentation.

The capability subclass is VIe.

VxE—Vandalia silt loam, 15 to 35 percent slopes, very stony

This soil is very deep to steep and well drained. It is on foot slopes along the base of steeper slopes and around the heads of drainageways in most parts of the county. Stones 1 to 2 feet in diameter cover from 1 to 3 percent of the surface of this soil.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of 52 inches. The upper 5 inches is reddish brown silt loam. The next 15 inches is reddish brown channery silty clay loam. The lower 26 inches is reddish brown channery silty clay. The substratum extends below a depth of 65 inches. It is reddish brown very channery silty clay.

Included with this soil in mapping are a few small areas of the well drained Chagrin, Gilpin, Lily, Sensabaugh, and Upshur soils and the moderately well drained Lobdell and Zoar soils. Also included are a few small areas of soils where stones and boulders cover as much as 15 percent of the surface, areas of soils that have slope of less than 15 percent or more than 35 percent, and a few small areas of soils where more than 75 percent of the topsoil has been eroded and the subsoil is exposed in places. Included soils make up about 25 percent of this map unit.

The available water capacity is moderate or high. Permeability in the subsoil is slow or moderately slow. Runoff is rapid or very rapid. Natural fertility is medium or high. In unlimed areas, this soil is moderately acid to very strongly acid in the solum and strongly acid to slightly acid in the substratum. Depth to bedrock is more than 60 inches.

Most areas are used for woodland. Some areas are used for pasture.

This soil is not suited to cultivated crops or hay and is not easily managed for pasture. The severe hazard of erosion on unvegetated areas and overgrazing of pasture are major management concerns. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

This soil has moderately high potential productivity for trees. Common tree species on this unit include red oak,

white oak, black oak, Virginia pine, American beech, and yellow-poplar. Plant competition, the equipment limitation, and erosion control are management concerns. Intensive management to keep undesirable plants from competing with native plants or planted seedlings is needed to establish a desirable stand. The use of equipment is restricted during the wet seasons because of poor traction and low soil strength. Placing roads and skid trails near the contour, diverting surface water from the road, establishing and maintaining a crown on the road, and establishing and maintaining sod on bare roadbanks can help to control erosion.

Slope, high shrink-swell potential in the subsoil, slow permeability in the subsoil, and slippage are the main limitations for dwellings and septic tank absorption fields. This soil is not suited to most urban uses. Selecting alternate sites of soils with fewer limitations should be considered for dwellings and septic tank absorption fields. If vegetation on this soil is removed, establishing plant cover in unvegetated areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is VIIs.

ZoB—Zoar silt loam, 3 to 8 percent slopes

This soil is very deep and moderately well drained. It is on stream terraces in the central and northern parts of the county along smaller streams that are tributaries to Elk and Little Kanawha Rivers.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 34 inches. The upper 4 inches is yellowish brown silt loam. The next 6 inches is dark yellowish brown silty clay and the next 7 inches is strong brown silty clay mottled with light gray. The lower 9 inches is light gray silty clay mottled with reddish yellow. The substratum extends to a depth of at least 65 inches. The upper 6 inches is light gray silty clay mottled with reddish yellow. The next 10 inches is strong brown clay loam mottled with light gray. The lower 15 inches is dark brown clay loam mottled with light gray.

Included with this soil in mapping are a few small areas of the well drained Allegheny, Sensabaugh, and Vandalia soils and Udorthents and the moderately well drained Monongahela soils. Also included are a few small areas of soils that have slope of less than 3 percent or more than 8 percent. Included soils make up about 15 percent of this map unit.

The available water capacity of this Zoar soil is moderate or high. Permeability in the subsoil is slow or moderately slow. Runoff is medium. Natural fertility is low. A seasonal high water table is about 2 feet below the surface. It restricts the root zone of some plants. In unlimed areas, this soil is very strongly acid. Depth to bedrock is more than 60 inches.

Most areas are used for meadow or pasture. A few areas are used for community development.

This soil is suited to cultivated crops, hay, and pasture. The hazard of erosion is moderate in unvegetated areas and is a management concern. If the soil is cultivated, using conservation tillage, growing crops in contour strips, using a rotation that includes hay crops, and returning crop residue to the soil are practices that help to control erosion and to maintain soil fertility and tilth. Proper stocking rates to maintain desirable grasses and legumes, rotational grazing, and deferred grazing in spring until the soil is reasonably firm are major pasture management needs.

The soil has moderately high potential productivity for trees, but only a small acreage is wooded.

The seasonal high water table and slow permeability in the subsoil are the main limitations of this soil for dwellings and septic tank absorption fields. Sealing foundation walls, installing foundation drains and backfilling with porous material, and using diversions to intercept water from higher areas help to prevent wet basements. Selecting areas of less clayey soils, increasing the area of the septic tank absorption field, placing absorption fields on the contour, and installing diversions to intercept water from higher areas help to keep effluent from seeping to the surface or backing up in the dwelling. Selecting a more suitable soil is needed to overcome the limitations. Minimizing removal of vegetative cover on construction sites helps to control erosion. Establishing a plant cover on disturbed areas and providing for proper surface water disposal help to control erosion and sedimentation.

The capability subclass is IIe.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to

economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

The survey area contains about 12,235 acres of prime farmland. That acreage is mainly adjacent to the major waterways. It makes up about 3.7 percent of the total acreage in the survey area.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Richard Heaslip, state resource conservationist, Natural Resources Conservation Service, helped to prepare this section.

Some general principles apply throughout the county to all of the soils suitable for farm crops and pastures; individual soils or groups of soils require different kinds of management.

Most of the soils in Braxton County are low or moderate in fertility and require lime and fertilizer for optimum production. The amounts applied depend on the type of soil, the cropping history, the type of crop grown, the level of yields desired, and tests and analysis of the individual samples.

The organic matter content is low in most of the soils; it is generally not feasible to build it to a higher level. It is important, however, to maintain the current level by adding manure; by returning crop residue to the soil; and by growing sod crops, cover crops, and green-manure crops.

Tillage tends to break down the soil structure of the surface layer. It should be kept to the minimum necessary to prepare the seedbed and control weeds. In some soils, constant tillage also causes the formation of a firm, dense layer immediately below the plow layer that interferes with percolation and root penetration. Maintaining the organic matter content of the plow layer also helps to protect the soil structure.

Runoff and erosion on farmland occur mainly while a cultivated crop is growing or soon after it has been harvested. All the gently sloping and steeper soils that are cultivated are subject to erosion and thus require a cropping system suitable for erosion control. The main management needs of such a system include the proper rotation of crops, minimum tillage, no-till planting, using crop residue, growing cover crops and green-manure crops, and applying lime and fertilizer. Other major erosion-control measures are contour cultivation, contour stripcropping, diverting runoff, and using grassed waterways. The effectiveness of a particular combination of these measures differs from one soil to another, but different combinations can be equally effective on the same soil.

Using the soil for pasture is effective in controlling erosion in most areas. A high level of pasture management, including fertilization, controlled grazing, and careful selection of pasture mixtures, is needed on some soils to provide enough plant cover to prevent excessive erosion. Grazing is controlled by rotating the livestock from one field to another and allowing idle

periods for the regrowth from one field to another and allowing idle periods for the regrowth of the pasture plants. Some soils need plant mixtures that require less renovation to maintain good ground cover and forage for grazing. These can generally be obtained by management of grazing animals and optimum use of such soil amendments as lime and fertilizer.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey (*8*).

Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly

because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Charles L. Rowan, state staff forester, Natural Resources Conservation Service, helped to prepare this section.

Woodland in Braxton County amounts to 253,000 acres, or 76 percent of the total area. The size of the woodland tracts ranges from small farm woodlots to larger, corporate-owned areas of several thousand acres. The largest woodland tracts are in the eastern fifth of the county, which also contains many of the largest and best trees left to harvest.

The common forest types, or natural associations of tree species, and their percent of the wooded area are: oak-hickory, 54 percent; maple-beech-birch, 29 percent; other hardwoods, 15 percent; and pine, 2 percent (*3*).

Woodland plays an important part in the economy of Braxton County. There are currently four, full-time sawmill operations in the county in addition to several smaller sawmills that operate on a part-time basis. Also, a large stave mill uses white oak to make barrels, one company uses various hardwoods to make railroad ties, and another company manufactures sewing machine cabinets. Nearly all higher grades of lumber are shipped to states in the south or overseas to be manufactured into fine furniture.

Since about 1960, several hundred acres of abandoned meadows and pastures has been planted mostly to white pine and some Scotch, Virginia, and red pine. Many of the early plantings have reached sawlog size. Also, a large Christmas tree plantation and several smaller ones are operating in the county.

The aspects of some soils, generally those that have slope of more than 15 percent, affect potential productivity. North aspects are those that face in any compass direction from 315 degrees to 135 degrees. South aspects are those that face in any compass direction from 135 degrees to 315 degrees. The soils on north aspects generally are more moist than those on south aspects and commonly are rated as having higher productivity. Aspect also affects the occurrence of a tree species and the degree of management concerns.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol,* a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either

as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* (fig. 16) and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. Average annual growth per acre of some of the common trees is expressed as cubic feet per acre, board feet per acre, and cords per acre.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Recreation

John Cox, district conservationist, Natural Resources Conservation Service, helped to prepare this section.

Braxton County has two excellent recreational facilities at Burnsville and Sutton Lakes. Each facility comprises more than 13,000 acres and offers boating, fishing, swimming, scuba diving, hiking, hunting, and camping.

The Elk, Little Kanawha, Birch, and Holly Rivers also provide excellent opportunities for outdoor recreation.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is

Figure 16.—Taking site index data on a young stand of white oak in an area of Gilpin-Upshur silt loams, 35 to 70 percent slopes.

not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Gary A. Gwinn, state biologist, Natural Resources Conservation Service, helped to prepare this section.

Present and predicted future land use patterns in Braxton County favor those species of wildlife that inhabit woodlands and the transitional zone between openland

and woodland. The county supports many white-tailed deer. Wild turkeys are rapidly increasing in number and even black bears are becoming more numerous. The forests of Braxton County also provide suitable habitat for gray squirrels, fox squirrels, ruffed grouse, woodland furbearers, and a variety of cavity-nesting birds.

The populations of most woodland wildlife species are not likely to decrease drastically in the future as land use is not expected to undergo massive change. Large scale land clearing for agricultural use is past. As timber is harvested, the land will be permitted to return to timber production. As such, county landowners can favor certain species of woodland wildlife by utilizing the harvesting methods most beneficial to those species.

Some species of openland wildlife, or "farm game," have declined with the reduction in number of small family farms. Bobwhite quail are rare. Even cottontail rabbits are not as numerous as they once were. These species thrive in areas with mixed, interspersed patterns of grassland (legumes), cropland (small grain), and shrub cover (hedgerows). Individual landowners can produce suitable habitat by creating the necessary land use pattern.

Populations of several species of waterfowl have increased in size since the construction of large reservoirs, such as Burnsville and Sutton Lakes. Although such populations do not compare in terms of total numbers with those of coastal areas, the lakes, ponds, and streams of Braxton County provide much better habitat than that found in most regions of the state. Transplanted Canada geese are well established and are reproducing in many sections. County residents can facilitate additional reproduction by creating nesting sites on privately owned ponds.

Braxton County's waters support large populations of several species of game fish, including smallmouth bass (fig. 17), largemouth bass, muskellunge, walleye, channel catfish, and a variety of sunfish. Maintenance of good water quality is essential to insure this fisheries resource. County residents need to eliminate and prevent further point and nonpoint sources of pollution in protecting this resource.

Most fish and game populations in Braxton County are well established. While a few species are declining in numbers, others are increasing. Habitat manipulation can result in localized increases of the declining species. Landowners can greatly impact wildlife within the perimeters of their personal property.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggar-ticks, quackgrass, ragweed, foxtail, wild carrot, and panicgrass.

Figure 17.—An area along the Birch River that provides excellent habitat for smallmouth bass.

Hardwood trees and shrubs produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are gray dogwood and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, arrowhead, burreed, pickerelweed, cordgrass, rushes, and sedges.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, meadow vole, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of

deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrats, frogs, and tree swallows.

Engineering

Michael M. Blaine, state conservation engineer, Natural Resources Conservation Service, helped to prepare this section.

This section provides information for planning land uses related to urban development and water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, soil density, shear strength, bearing strength, and consolidation. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, impoundments, and topsoil; plan drainage systems, irrigation systems, ponds, agricultural waste storage structures, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity (fig. 18).

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems,

Figure 18.—Road failure caused by low soil strength and steep slopes.

and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter,

and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soils that have slope of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The

limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A low available water capacity, restricted rooting depth, toxic substances, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 17 gives the frequency of flooding.

Frequency is estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not

insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udult*, the suborder of the Ultisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludults.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

Dr. John Sencindiver, professor of agronomy, West Virginia Agricultural and Forestry Experiment Station, helped to prepare this section.

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (*7*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*10*). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Allegheny Series

The Allegheny series consists of very deep, well drained soils formed in acid, alluvial deposits from soils on uplands. These soils are on terraces along the Elk and Little Kanawha Rivers. Slope ranges from 3 to 8 percent.

Allegheny soils are on the landscape with the well drained Chavies soils and the moderately well drained Monongahela and Zoar soils. Allegheny soils contain more clay in the B horizon than and have a lower base saturation than Chavies soils. They are better drained than Monongahela and Zoar soils.

Typical pedon of Allegheny loam, 3 to 8 percent slopes, about 175 feet northeast of County Road 17/10, 500 feet

northeast of Centralia Church, and 1,000 feet northwest of Bakers Run picnic area in a meadow; USGS Erbacon topographic quadrangle; lat. 38 degrees, 37 minutes, 29 seconds N. and long. 80 degrees, 34 minutes, 00 seconds W.

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) loam; moderate medium granular structure; friable; many fine and medium roots; 5 percent cobbles; slightly acid; abrupt smooth boundary.

BA—7 to 13 inches; yellowish brown (10YR 5/6) clay loam; weak medium subangular blocky structure; friable; common fine and medium roots; 10 percent cobbles; strongly acid; clear wavy boundary.

Bt1—13 to 31 inches; yellowish brown (10YR 5/6) cobbly clay loam; moderate medium subangular blocky structure; friable; few discontinuous clay films on faces of peds; common fine roots; 15 percent cobbles; strongly acid; gradual wavy boundary.

Bt2—31 to 43 inches; yellowish brown (10YR 5/8) sandy clay loam; weak medium subangular blocky structure; friable; few discontinuous clay films on faces of peds; few fine roots; 10 percent cobbles; strongly acid; clear wavy boundary.

C1—43 to 55 inches; yellowish brown (10YR 5/6) clay loam; common distinct strong brown (7.5YR 5/8) mottles; massive; firm; strongly acid; clear wavy boundary.

C2—55 to 65 inches; strong brown (7.5YR 5/8) sandy clay loam; pockets of sandy loam; massive; firm; strongly acid.

The solum thickness ranges from 40 to 50 inches. Depth to bedrock is more than 60 inches. Rock fragments of gravel and cobbles range, by volume, from 0 to 15 percent in the solum and from 0 to 35 percent in the C horizon. Unlimed soils are strongly acid or very strongly acid.

The Ap horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4, and chroma of 2.

The BA horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is loam or clay loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 6 to 8. Texture of the fine earth material is loam, clay loam, or sandy clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 6 to 8. Texture of the fine earth material is loam, sandy clay loam, or clay loam.

Buchanan Series

The Buchanan series consists of very deep, moderately well drained soils formed in acid, colluvial material that moved downslope from soils on uplands. These soils are on colluvial fans, foot slopes, side slopes, and benches, in coves, and along drainageways mostly in the eastern and southeastern parts of the county. Slope ranges from 15 to 35 percent.

Buchanan soils are on the landscape with Chavies, Gilpin, Lily, Pineville, and Pope soils and Udorthents. Unlike Buchanan soils, Chavies, Gilpin, Lily, Pineville and Pope soils and Udorthents are well drained. Buchanan soils have a fragipan that is not typical of any of these soils.

Typical pedon of Buchanan channery loam, 15 to 35 percent slopes, extremely stony, about 20 feet north of County Road 40 and about 0.2 mile northeast of the confluence of Carpenter Fork with Little Birch River in a wooded area; USGS Little Birch topographic quadrangle; lat. 38 degrees 34 minutes 11 seconds N. and long. 80 degrees 41 minutes 42 seconds W.

Oi—2 inches to 1 inch; hardwood leaf litter.

Oe—1 inch to 0; moderately decomposed organic material.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) channery loam; moderate fine and medium granular structure; friable; many fine, medium, and coarse roots; about 15 percent rock fragments; very strongly acid; abrupt smooth boundary.

E—1 to 4 inches; dark brown (10YR 3/3) channery loam; moderate fine and medium granular structure; friable; many fine, medium, and coarse roots; about 15 percent rock fragments; very strongly acid; clear wavy boundary.

BE—4 to 11 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; many medium and coarse roots; about 10 percent rock fragments; very strongly acid; clear wavy boundary.

Bt1—11 to 18 inches; yellowish brown (10YR 5/4) channery loam; moderate medium subangular blocky structure; friable; few distinct clay films on faces of peds; many fine and medium roots; about 15 percent rock fragments; very strongly acid; clear wavy boundary.

Bt2—18 to 25 inches; yellowish brown (10YR 5/6) channery clay loam; few fine distinct grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; few distinct clay films on faces of peds; many fine and medium roots; about 20 percent rock fragments; extremely acid; clear wavy boundary.

Btx1—25 to 42 inches; strong brown (7.5YR 5/6) channery loam; many medium distinct pinkish gray (7.5YR 6/2) mottles; weak very coarse prismatic structure parting to weak coarse subangular blocky; very firm and brittle; common distinct clay films on faces of prisms; about 25 percent rock fragments; very strongly acid; gradual wavy boundary.

Btx2—42 to 58 inches; strong brown (7.5YR 5/6) channery sandy clay loam; many medium distinct pinkish gray (7.5YR 6/2) mottles; weak very coarse prismatic structure parting to weak very coarse platy; very firm and brittle; common distinct clay films on faces of prisms; about 25 percent rock fragments; extremely acid.

C—58 to 65 inches; yellowish brown (10YR 5/6) very channery sandy loam; common, medium, distinct pinkish gray (7.5YR 6/2) and yellowish red (5YR 5/6) mottles; massive; firm; about 45 percent rock fragments; extremely acid.

The solum thickness ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. Rock fragments of sandstone and shale range, by volume, from 5 to 35 percent in individual horizons above the fragipan and from 25 to 50 percent in the fragipan and C horizon. Unlimed soils are extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

The E horizon has hue of 10YR, value of 3 or 4, and chroma of 3. Texture of the fine earth material is loam.

The BE horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4. Texture of the fine earth material is loam or silt loam.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is loam, silt loam, or clay loam.

The Btx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is loam, clay loam, or sandy clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture of the fine earth material is sandy loam, loam, or clay loam.

Chagrin Series

The Chagrin series consists of very deep, well drained soils formed in alluvial material washed from soils on uplands. These soils are on flood plains of secondary streams in the central and western parts of the county. They are subject to occasional flooding. Slope ranges from 0 to 3 percent.

Chagrin soils are on the landscape with the well drained Pope and Sensabaugh soils and the moderately well drained Lobdell soils. Chagrin soils contain more clay in the B horizon than Pope soils. They have less rock fragments than Sensabaugh soils. They are better drained than Lobdell soils.

Typical pedon of Chagrin silt loam, about 4,000 feet downstream from the confluence of Barbecue Run with Knawl's Creek; USGS Orlando topographic quadrangle; lat. 38 degrees 49 minutes 49 seconds N. and long. 80 degrees 32 minutes 34 seconds W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak medium and coarse subangular blocky structure parting to weak fine and medium granular; friable; many fine roots; slightly acid; abrupt smooth boundary.

Bw—8 to 35 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; many fine roots; moderately acid; clear wavy boundary.

C1—35 to 45 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; few fine roots; moderately acid; gradual wavy boundary.

C2—45 to 58 inches; brown (10YR 4/4) loam; massive; loose; 15 percent rock fragments; moderately acid; gradual wavy boundary.

C3—58 to 65 inches; brown (10YR 4/4) gravelly loam; massive; loose; 25 percent rock fragments; moderately acid.

The solum thickness ranges from 24 to 40 inches. Depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 0 to 15 percent in the solum and to as much as 25 percent below a depth of 40 inches. Unlimed areas are moderately acid to neutral.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 to 3.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Texture of the fine earth material is silt loam, loam, silty clay loam, or clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 6. Texture of the fine earth material is silt loam, loam, or sandy loam.

Chavies Series

The Chavies series consists of very deep, well drained soils formed in acid, alluvial deposits from soils on uplands. These soils are on high flood plains along the Elk, Little Kanawha, and Holly Rivers. These soils are subject to rare flooding. Slope ranges from 0 to 3 percent.

Chavies soils are on the landscape with the well drained Allegheny, Craigsville, Pope, and Vandalia soils and the moderately well drained Buchanan, Monongahela, and Zoar soils. Chavies soils have more clay in the B horizon than Craigsville and Pope soils. Chavies soils contain less clay in the B horizon than Allegheny or Vandalia soils. Chavies soils have higher base saturation than Allegheny soils and are better drained than Buchanan, Monongahela, and Zoar soils.

Typical pedon of Chavies fine sandy loam, in an area of Chavies fine sandy loam, rarely flooded, in a meadow on the right fork of Holly River, about 200 feet south of County Road 15 and approximately 400 feet northeast of the confluence of Cabin Run with the right fork of Holly River; USGS Newville topographic quadrangle; lat. 38

degrees 39 minutes 14 seconds N. and long. 80 degrees 31 minutes 38 seconds W.

Ap—0 to 12 inches; dark brown (10YR 3/3) fine sandy loam; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.
Bt—12 to 30 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; common fine and medium roots; moderately acid; clear wavy boundary.
BC—30 to 36 inches; strong brown (7.5YR 4/6) fine sandy loam; weak coarse subangular blocky structure; friable; few fine and medium roots; moderately acid; clear wavy boundary.
C—36 to 65 inches; strong brown (7.5YR 4/6) sandy loam common medium distinct brown (10YR 5/3) mottles; massive; friable; moderately acid.

The solum thickness ranges from 30 to 40 inches. The depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 0 to 10 percent in individual horizons of the solum and from 0 to 20 percent in the C horizon. Unlimed soils range from strongly acid to slightly acid.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is fine sandy loam or loam.

The BC horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is loam or fine sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is fine sandy loam, sandy loam, or loam.

Craigsville Series

The Craigsville series consists of very deep, well drained soils formed in alluvial material washed from acid soils on uplands. These soils are on high flood plains and on alluvial fans at the mouth of hollows in the eastern and southeastern parts of the county. They are subject to rare flooding. Slope ranges from 0 to 3 percent.

Craigsville soils are on the landscape with the well drained Chavies, Pope, and Sensabaugh soils. Craigsville soils have more rock fragments in the B and C horizons than Chavies, Pope, and Sensabaugh soils.

Typical pedon of Craigsville gravelly sandy loam, in a meadow on the right fork of Holly River, about 0.5 mile east of the confluence of Robinson Run with the right fork of Holly River; USGS Newville topographic quadrangle; lat. 38 degrees 39 minutes 48 seconds N. and long. 80 degrees 31 minutes 46 seconds W.

Ap—0 to 6 inches; dark brown (10YR 3/3) gravelly sandy loam; weak fine granular structure; very friable; many fine and medium roots; about 30 percent rock fragments; very strongly acid; abrupt wavy boundary.
BA—6 to 12 inches; dark yellowish brown (10YR 4/4) very cobbly loam; weak medium subangular blocky structure; friable; common fine roots; about 45 percent rock fragments; very strongly acid; clear wavy boundary.
Bw1—12 to 19 inches; yellowish brown (10YR 5/6) very gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; about 55 percent rock fragments; strongly acid; gradual wavy boundary.
Bw2—19 to 35 inches; yellowish brown (10YR 5/4) extremely cobbly sandy loam; weak fine subangular blocky structure; friable; few fine roots; about 70 percent rock fragments; strongly acid; gradual wavy boundary.
C—35 to 65 inches; yellowish brown (10YR 5/4) extremely cobbly loamy sand; massive; very friable; occasional fine roots; about 65 percent rock fragments; strongly acid.

The solum thickness ranges from 20 to 40 inches. The depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 15 to 35 percent in the A horizon and from 35 to 70 percent in individual horizons of the B and C horizons. Unlimed soils are very strongly acid or strongly acid.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3.

The BA horizon has hue of 10YR, value of 4 or 5, and chroma of 4. Texture of the fine earth material is loam or sandy loam.

The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is sandy loam or loam.

The C horizon has hue of 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is sandy loam or loamy sand.

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils formed in acid material weathered from interbedded siltstone, shale, and sandstone. Gilpin soils are on ridgetops, benches, and side slopes throughout the county. Slope ranges from 8 to 70 percent.

Gilpin soils are on the landscape with the well drained Lily, Myra, Pineville, Upshur, and Vandalia soils and Udorthents and the moderately well drained Buchanan soils. Gilpin soils have less sand in the Bt horizon than Lily

soils and less clay in the Bt horizon than Upshur and Vandalia soils. Gilpin soils are better drained than Buchanan soils. They have fewer rock fragments in the control section than Myra soils and Udorthents. Gilpin soils are not as deep as Pineville, Upshur, Vandalia, and Myra soils and Udorthents.

Typical pedon of Gilpin silt loam, in an area of Gilpin-Upshur silt loams, 35 to 70 percent slopes; about 0.5 mile east of the confluence of Barbecue Run with Knawl's Creek; 15 feet north of Knawl's Creek Road in a wooded area; Orlando topographic quadrangle; lat. 38 degrees 49 minutes 40 seconds N. and long. 80 degrees 32 minutes 11 seconds W.

Oi—4 inches to 1 inch; hardwood leaf litter.

Oe—1 inch to 0; moderately decomposed organic material.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam; moderate fine and medium granular structure; friable; many coarse roots; about 5 percent rock fragments; very strongly acid; abrupt wavy boundary.

E—1 to 3 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; friable; many coarse roots; about 5 percent rock fragments; very strongly acid; abrupt wavy boundary.

BE—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many coarse roots; about 5 percent rock fragments; very strongly acid; clear wavy boundary.

Bt—7 to 24 inches; strong brown (7.5YR 5/6) channery silty clay loam; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; many coarse roots; about 15 percent rock fragments; very strongly acid; clear wavy boundary.

C—24 to 31 inches; strong brown (7.5YR 5/6) channery silt loam; massive; friable; few coarse roots about 30 percent rock fragments; very strongly acid, clear wavy boundary.

R—31 inches; interbedded sandstone and shale.

The solum thickness ranges from 18 to 30 inches. The depth to bedrock ranges from 20 to 40 inches. Rock fragments of shale, siltstone, and sandstone range, by volume, from 5 to 25 in individual horizons of the solum and from 30 to 65 percent in the C horizon. Unlimed soils are extremely acid to strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The E horizon has hue of l0YR, value of 3 or 4, and chroma of 2 to 4. Texture of the fine earth material is silt loam or loam.

The BE horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 4 to 6. Texture of the fine earth material is silt loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is silt loam or silty clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth material is loam, silt loam, or silty clay loam.

Lily Series

The Lily series consists of moderately deep, well drained soils formed in acid material weathered from sandstone. These soils are on ridgetops and benches mostly in the eastern part of the county. Slope ranges from 8 to 35 percent.

Lily soils are on the landscape with the well drained Gilpin, Pineville, and Upshur soils and Udorthents and the moderately well drained Buchanan soils. Lily soils have more sand in the Bt horizon than Gilpin soils and less clay in the Bt horizon than Upshur soils. Lily soils are better drained than Buchanan soils. They have fewer rock fragments in the control section than Udorthents. Lily soils are not as deep as Pineville, Upshur, and Buchanan soils and Udorthents.

Typical pedon of Lily loam, in an area of Gilpin-Lily complex, 8 to 15 percent slopes, about 0.25 mile south of intersection of Pretty Run Road and Green Hill Road in an abandoned meadow reverting to woodland; USGS Walkersville topograhic quadrangle; lat. 38 degrees 45 minutes 43 seconds N. and long. 80 degrees 28 minutes 07 seconds W.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine, medium, and coarse roots; very strongly acid; abrupt smooth boundary.

BA—6 to 10 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; many fine, medium, and coarse roots; very strongly acid; clear wavy boundary.

Bt1—10 to 19 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; common distinct clay films; many fine, medium, and coarse roots; about 5 percent rock fragments; very strongly acid; clear wavy boundary.

Bt2—19 to 23 inches; strong brown (7.5YR 5/8) clay loam; weak fine subangular blocky structure; friable; distinct clay films; common fine and medium roots; about 10 percent rock fragments; very strongly acid; clear wavy boundary.

C—23 to 27 inches; strong brown (7.5YR 5/8) channery clay loam; massive; friable; few fine roots; about 30 percent rock fragments; extremely acid; clear wavy boundary.

R—27 inches; sandstone bedrock.

The solum thickness ranges from 22 to 34 inches. The depth to bedrock ranges from 20 to 40 inches. Rock fragments of sandstone range, by volume, from 0 to 20 percent in individual horizons of the solum and from 0 to 30 percent in the C horizon. Unlimed soils are strongly acid to extremely acid.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4.

The BA horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4. Texture of the fine earth material is loam.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. Texture of the fine earth material is loam or clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 to 8. Texture is clay loam, loam, sandy loam, or loamy sand. In some profiles, the C horizon is underlain by a Cr horizon of highly weathered sandstone.

Lobdell Series

The Lobdell series consists of very deep, moderately well drained soils formed in alluvial material washed from both limy and acid soils on uplands. These soils are on flood plains of secondary streams in the central and western parts of the county. They are subject to occasional flooding. Slope ranges from 0 to 3 percent.

Lobdell soils are on the landscape with the well drained Chagrin, Pope, and Sensabaugh soils. Lobdell soils are less well drained than Chagrin, Pope, and Sensabaugh soils.

Typical pedon of Lobdell silt loam, in a pasture about 200 feet southwest of the intersection of Flatwoods Cemetery Road and County Road 19/20; USGS Sutton topographic quadrangle; lat. 38 degrees 43 minutes 24 seconds N. and long. 80 degrees 38 minutes 57 seconds W.

Ap—0 to 8 inches; dark brown (7.5YR 4/2) silt loam; weak medium subangular blocky structure; friable; common fine roots; moderately acid; gradual wavy boundary.

Bw1—8 to 18 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; moderately acid; gradual wavy boundary.

Bw2—18 to 32 inches; brown (7.5YR 5/4) loam; few fine distinct pinkish gray (7.5YR 6/2) mottles; moderate medium subangular blocky structure; friable; few very fine roots; slightly acid; gradual wavy boundary.

C1—32 to 55 inches; brown (7.5YR 5/4) loam; common medium distinct pinkish gray (7.5YR 6/2) mottles; massive; friable; common iron and manganese concretions and coatings; slightly acid; gradual wavy boundary.

C2—55 to 65 inches; mixed light olive brown (2.5Y 5/6), strong brown (7.5YR 5/8), and gray (10YR 6/1) sandy clay loam; massive; friable; neutral.

The solum thickness ranges from 24 to 40 inches. Depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 0 to 5 percent in the surface layer and from 0 to 15 percent in the B and C horizons. Unlimed soils are moderately acid to neutral.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3.

The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Texture of the fine earth material is silt loam or loam.

The C horizon has hue of 7.5YR or 2.5Y, value of 4 to 6, and chroma of 1 to 8. Texture is silt loam, loam, sandy clay loam, or fine sandy loam.

Monongahela Series

The Monongahela series consists of very deep, moderately well drained soils formed in acid, alluvial deposits that washed from soils on uplands. These soils are on terraces along the major streams of the county. Slope ranges from 3 to 8 percent.

Monongahela soils are on the landscape with the well drained Allegheny and Chavies soils and the moderately well drained Zoar soils. Unlike Allegheny, Chavies, and Zoar soils, Monongahela soils have a fragipan.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, in a cornfield about 1,000 feet northwest of Fisher Cemetery and about 0.8 mile northwest of the Flatwoods exit on Interstate 79; USGS Sutton topographic quadrangle; lat. 38 degrees 42 minutes 28 seconds N. and long. 80 degrees 40 minutes 34 seconds W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many fine and medium roots; moderately alkaline; abrupt smooth boundary.

Bt—10 to 24 inches; strong brown (7.5YR 5/8) clay loam; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; few manganese and iron stains; strongly acid; abrupt wavy boundary.

Btx1—24 to 48 inches; strong brown (7.5YR 5/6) clay loam; common medium distinct pinkish gray (7.5YR 6/2) mottles; weak very coarse prismatic parting to weak medium subangular blocky; very firm and brittle; common distinct clay skins on faces of prisms; many manganese and iron stains; about 10 percent gravel; strongly acid; clear wavy boundary.

Btx2—48 to 58 inches; strong brown (7.5YR 5/6) clay loam; many medium distinct pinkish gray (7.5YR 6/2) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm and brittle; common

distinct clay films on faces of prisms; many manganese and iron stains; about 10 percent gravel; very strongly acid; clear wavy boundary.

C—58 to 65 inches; strong brown (7.5YR 5/6) silty clay loam; many coarse distinct pinkish gray (7.5YR 6/2) mottles; massive; friable; many manganese and iron stains; strongly acid.

The solum thickness ranges from 40 to 60 inches. The depth to the fragipan ranges from 20 to 30 inches. The depth to bedrock is more than 60 inches. Rock fragments of rounded pebbles and cobbles range, by volume, from 0 to 10 percent in individual horizons above the fragipan, from 0 to 15 percent in the fragipan, and from 0 to 20 percent in the C horizon. Unlimed soils are strongly acid or very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The Bt horizon has hue of l0YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. Texture of the fine earth material is silt loam, loam, clay loam, or silty clay loam.

The Btx horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. Texture of the fine earth material is silt loam, loam, clay loam, or sandy clay loam.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 8. Texture of the fine earth material is loam, silt loam, silty clay loam, or clay loam.

Myra Series

The Myra series consists of very deep, well drained soils formed in regolith from the surface mining of coal. The regolith is mixed partly with weathered calcareous bedrock fragments and partially weathered fine earth in areas that have been disturbed by surface mine operations. The Myra soils are on ridgetops, side slopes, and foot slopes. Slope ranges from 25 to 35 percent.

Myra soils are on the landscape with the well drained Gilpin, Pineville, and Upshur soils. Myra soils have more rock fragments in the control section than Gilpin, Pineville, or Upshur soils.

Typical pedon of Myra channery clay loam, steep, very stony, in a pasture about 0.7 mile southeast of Copen along West Virginia Route 2; USGS Burnsville topographic quadrangle; lat. 38 degrees 50 minutes 15 seconds N. and long. 80 degrees 42 minutes 40 seconds W.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) channery clay loam; moderate fine and medium granular structure; friable; many fine and medium roots; about 20 percent channers (60 percent mudstone and 40 percent sandstone); moderately alkaline; slightly effervescent; clear wavy boundary.

C1—6 to 28 inches; yellowish brown (10YR 5/4) very channery clay loam; common fine distinct gray (7.5YR 5/0) lithochromic mottles; massive; friable; many fine and medium roots; about 40 percent channers (55 percent mudstone and 45 percent sandstone); moderately alkaline; slightly effervescent; gradual wavy boundary.

C2—28 to 37 inches; yellowish brown (10YR 5/4) very channery clay loam; many fine distinct gray (7.5YR 5/0) lithochromic mottles; massive; friable; common fine and medium roots; about 50 percent channers (50 percent mudstone and 50 percent sandstone); moderately alkaline; slightly effervescent; gradual wavy boundary.

C3—37 to 65 inches; reddish brown (5YR 4/4) very stony clay loam; many fine distinct gray (7.5YR 5/0) lithochromic mottles; massive; friable; about 60 percent stones (50 percent mudstone and 50 percent sandstone); moderately alkaline; slightly effervescent.

The depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 15 to 50 percent in the A horizon and from 35 to 60 percent in the C horizon. Rock fragments are mainly calcareous mudstone, sandstone, and shale and small amounts of coal. The percentage of each is less than 65 percent of the total rock fragments in the control section. Unlimed soils are slightly acid to moderately alkaline.

The Ap horizon has hue of 2.5Y, 10YR, or 7.5YR, value of 4 or 5, and chroma of 2 to 6. The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 2 to 8. Texture of the fine earth material is clay loam or silty clay loam.

Pineville Series

The Pineville series consists of very deep, well drained soils formed in acid, colluvial material. These soils are on mountain coves and side slopes. Slope ranges from 35 to 70 percent.

Pineville soils are on the landscape with the well drained Gilpin, Lily, and Myra soils and the moderately well drained Buchanan soils. Pineville soils are deeper than Gilpin and Lily soils. They have fewer rock fragments than Myra soils and are better drained than Buchanan soils.

Typical pedon of Pineville loam in an area of Gilpin-Pineville association, very steep, extremely stony, in a wooded area about 2,200 feet south of the confluence of Fall Run with the Right Fork of Holly River; USGS Newville topographic quadrangle; lat. 38 degrees 38 minutes 55 seconds N. and long. 80 degrees 31 minutes 12 seconds W.

Oi—3 inches to 1 inch; hardwood leaf litter.

Oe—1 inch to 0; moderately decomposed organic material.

A—0 to 5 inches; very dark brown (10YR 2/2) loam; moderate fine granular structure; very friable; many fine, medium, and coarse roots; about 10 percent rock fragments; slightly acid; abrupt wavy boundary.
BA—5 to 10 inches; dark yellowish brown (10YR 4/4) channery loam; weak fine and medium subangular blocky structure; friable; many fine, medium, and coarse roots; 15 percent rock fragments; strongly acid; clear wavy boundary.
Bt1—10 to 31 inches; yellowish brown (10YR 5/6) channery loam; moderate medium subangular blocky structure; friable; few discontinuous clay films on faces of peds and in pores; many fine, medium, and coarse roots; about 20 percent rock fragments; strongly acid; gradual wavy boundary.
Bt2—31 to 53 inches; yellowish brown (10YR 5/6) very channery loam; moderate medium subangular blocky structure; friable; few discontinuous clay films on faces of peds and in pores; many fine, medium, and coarse roots; about 40 percent rock fragments; strongly acid; clear wavy boundary.
BC—53 to 60 inches; yellowish brown (10YR 5/4) very channery loam; weak fine and medium subangular blocky structure; friable; few coarse roots; about 45 percent rock fragments; strongly acid; clear wavy boundary.
C—60 to 65 inches; yellowish brown (10YR 5/4) very channery loam; massive; friable; few coarse roots; about 60 percent rock fragments; strongly acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 10 to 45 percent in the A and B horizons and from 35 to 60 percent in the C horizon but average less than 35 percent, by volume, in the control section. Unlimed soils are very strongly acid to slightly acid in the A horizon and very strongly acid or strongly acid in the B and C horizons.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3.

The BA horizon has hue of 10YR, value of 4 to 6, and chroma of 4. Texture of the fine earth material is loam.

The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 8. Texture of the fine earth material is loam or clay loam.

The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 4. Texture of the fine earth material is loam.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8. Texture of the fine earth material is loam or sandy loam.

Pope Series

The Pope series consists of very deep, well drained soils formed in alluvial material washed from acid soils on uplands. These soils are on flood plains along the Little Kanawha, Holly, and Little Birch Rivers. These soils are subject to occasional flooding. Slope ranges from 0 to 3 percent.

Pope soils are on the landscape with the well drained Chagrin, Chavies, Craigsville, Sensabaugh, and Vandalia soils and the moderately well drained Buchanan and Lobdell soils. Pope soils have fewer rock fragments in the B and C horizons than Craigsville and Sensabaugh soils. Pope soils contain less clay in the B horizon than Chagrin, Chavies, and Vandalia soils. They are better drained than Lobdell and Buchanan soils.

Typical pedon of Pope sandy loam, on cropland reverting to woodland, about 1,000 feet east of the confluence of Cabin Run with the right fork of Holly River; Newville topographic quadrangle; lat. 38 degrees 39 minutes 13 seconds N. and long. 80 degrees 31 minutes 29 seconds W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) sandy loam; moderate fine and medium granular structure; very friable; many medium and coarse roots; strongly acid; abrupt smooth boundary.
BA—5 to 8 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine and medium subangular blocky structure; very friable; many medium and coarse roots; strongly acid; clear wavy boundary.
Bw1—8 to 22 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; very friable; many medium and coarse roots; strongly acid; clear wavy boundary.
Bw2—22 to 40 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; common medium and coarse roots; strongly acid; gradual wavy boundary.
C1—40 to 52 inches; yellowish brown (10YR 5/4) sandy loam; massive; very friable; few medium roots; strongly acid; clear wavy boundary.
C2—52 to 58 inches; yellowish brown (10YR 5/4) sandy clay loam; massive; very friable; strongly acid; gradual wavy boundary.
C3—58 to 65 inches; yellowish brown (10YR 5/6) loamy sand; massive; loose; strongly acid.

The solum thickness ranges from 30 to 45 inches. The depth to bedrock is more than 60 inches. Rock fragments of gravel range, by volume, from 0 to 20 percent in individual horizons of the solum and from 0 to 40 percent in the C horizon. Unlimed soils are strongly acid to extremely acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

The BA horizon has hue of 10YR, value of 4 or 5, and chroma of 4. Texture of the fine earth material is loam, fine sandy loam, or sandy loam.

The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is loam, fine sandy loam, or sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is sandy loam, loamy sand, or sandy clay loam.

Sensabaugh Series

The Sensabaugh series consists of very deep, well drained soils formed in alluvial material washed from soils on uplands. These soils are on flood plains of secondary streams in the central and western parts of the county. These soils are subject to occasional and rare flooding. Slope ranges from 0 to 3 percent.

Sensabaugh soils are on the landscape with the well drained Chagrin, Craigsville, and Pope soils and the moderately well drained Lobdell soils. Sensabaugh soils have more rock fragments throughout the profile than Chagrin, Lobdell, and Pope soils. Sensabaugh soils have fewer rock fragments throughout the profile than Craigsville soils.

Typical pedon of Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded, in a meadow about 100 feet southwest of County Road 12/3 and 0.5 mile southwest of and upstream from the confluence of Crooked Fork with Blowntimber Run in a meadow; USGS Gassaway topographic quadrangle; lat. 38 degrees 44 minutes 37 seconds N. and long. 80 degrees 50 minutes 29 seconds W.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium granular structure; friable; many fine and medium roots; about 5 percent rock fragments; neutral; abrupt smooth boundary.

Bw—7 to 20 inches; brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; many fine and medium roots; about 10 percent rock fragments; neutral; clear wavy boundary.

BC—20 to 29 inches; brown (7.5YR 4/4) gravelly clay loam; weak medium subangular blocky structure; friable; about 25 percent rock fragments; neutral; clear wavy boundary.

C1—29 to 38 inches; brown (7.5YR 4/4) very gravelly sandy clay loam; massive; very friable; about 40 percent rock fragments; neutral; gradual wavy boundary.

C2—38 to 65 inches; brown (7.5YR 4/4) very gravelly loam; massive; about 60 percent rock fragments; slightly acid.

The solum thickness ranges from 24 to 40 inches. The depth to bedrock is more than 60 inches. Rock fragments range, by volume, from 0 to 25 percent in the individual horizons of the solum and from 30 to 60 percent in the C horizon. Unlimed soils are moderately acid to mildly alkaline.

The Ap horizon has hue of 5YR, 75YR, or 10YR, value of 3 or 4, and chroma of 3 or 4.

The Bw horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. Texture of the fine earth material is silt loam, loam, clay loam, or sandy clay loam.

The BC horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. Texture of the fine earth material is loam, clay loam, or sandy clay loam.

The C horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. Texture of the fine earth material is clay loam or loam.

Udorthents

Udorthents generally consist of very deep, well drained soil material that has been disturbed by road construction and other urban development. Udorthents in Braxton County are along highways, railroads, mine sites, construction sites, and other areas that have been excavated or filled. Slope ranges from level to nearly vertical in cuts.

A typical pedon for Udorthents is not given because of the variability of these soils. The depth to bedrock is generally greater than 60 inches. Rock fragments of mudstone, sandstone, and shale vary in size and amount. The soils have hue of 5YR, 7.5YR, and 10YR, value of 3 to 6, and chroma of 2 to 8. Texture of the fine earth material is silt loam, loam, silty clay loam, or clay loam. Reaction ranges from very strongly acid to neutral.

Upshur Series

The Upshur series consists of deep, well drained soils formed in limy and acid material weathered from siltstone and shale. Upshur soils are on ridgetops, benches, and side slopes in the central and western parts of the county. Slope ranges from 8 to 70 percent.

Upshur soils are on the landscape with the well drained Gilpin, Lily, Myra, and Vandalia soils and Udorthents. Upshur soils have more clay in the Bt horizon than Gilpin and Lily soils and less sand in the particle-size control section than Vandalia soils. Upshur soils have fewer rock fragments in the control section than Myra soils and Udorthents.

Typical pedon of Gilpin-Upshur silt loams, 15 to 25 percent slopes, in a wooded area on the Braxton County 4-H grounds, about 450 feet north of the dining hall; USGS Sutton topographic quadrangle; lat. 38 degrees 41 minutes 12 seconds N. and long. 80 degrees 39 minutes 38 seconds W.

Oi—3 inches to 1 inch; hardwood leaf litter.

Oe—1 inch to 0; decomposed organic material.

A—0 to 2 inches; dark brown (7.5YR 4/2) silt loam; moderate fine granular structure; friable; many coarse roots; strongly acid; abrupt smooth boundary.

BA—2 to 5 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; many coarse roots; strongly acid; abrupt smooth boundary.

Bt1—5 to 14 inches; red (2.5YR 4/6) clay; strong medium subangular blocky structure; firm; many distinct clay films on faces of peds; many coarse roots; strongly acid; clear wavy boundary.

Bt2—14 to 28 inches; weak red (10R 4/4) clay; moderate coarse subangular blocky structure; firm; many distinct clay films on faces of peds; common coarse roots; strongly acid; clear wavy boundary.

Bt3—28 to 32 inches; weak red (10R 4/4) silty clay; weak medium subangular blocky structure; friable; many distinct clay films on faces of peds; few coarse roots; about 5 percent rock fragments; strongly acid; clear wavy boundary.

C—32 to 43 inches; weak red (10R 4/4) very channery silty clay loam; massive; friable; about 45 percent rock fragments; strongly acid; gradual wavy boundary.

R—43 inches; red and olive shale.

The solum thickness ranges from 26 to 40 inches. The depth to bedrock ranges from 40 to 55 inches. Rock fragments of shale and siltstone range, by volume, from 0 to 15 percent in individual horizons of the solum and from 10 to 45 percent in the C horizon. Unlimed soils are strongly acid or very strongly acid in the A horizon and strongly acid to mildly alkaline in the B and C horizons.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 to 4, and chroma of 2 to 4.

The BA horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. Texture of the fine earth material is silty clay loam.

The Bt horizon has hue of 10R, 2.5YR, or 5YR, value of 3 or 4, and chroma of 4 to 6. Texture of the fine earth material is silty clay or silty clay loam.

The C horizon has hue of 10R, 2.5YR, or 5YR, value of 3 or 4, and chroma of 4 to 6. Texture of the fine earth material is silty clay loam or silty clay.

In some profiles, the C horizon is underlain by a Cr horizon of highly weathered red and olive shale and siltstone.

Vandalia Series

The Vandalia series consists of very deep, well drained soils formed in limy and acid colluvial material that moved downslope from soils on uplands. These soils are on colluvial fans, foot slopes, benches, and along drainageways in the central and western parts of the county. Slope ranges from 8 to 35 percent.

Vandalia soils are on the landscape with the well drained Chavies, Gilpin, Pope, and Upshur soils and Udorthents and the moderately well drained Zoar soils. Vandalia soils have more clay in the B horizon than Gilpin, Chavies, or Pope soils and more sand in the particle-size control section than Upshur soils. They are better drained than Zoar soils. Vandalia soils have fewer rock fragments in the control section than Udorthents.

Typical pedon of Vandalia silt loam, 15 to 25 percent slopes, in an abandoned field reverting to woodland, on the Braxton County 4-H grounds, about 400 feet northwest of the dining hall; USGS Sutton topographic quadrangle; lat. 38 degrees 41 minutes 08 seconds N. and long. 80 degrees 39 minutes 37 seconds W.

Ap—0 to 6 inches; dark brown (7.5YR 4/2) silt loam; moderate medium granular structure; friable; many medium and coarse roots; about 5 percent rock fragments; strongly acid; abrupt smooth boundary.

BA—6 to 11 inches; reddish brown (5YR 4/3) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; many medium and coarse roots; about 5 percent rock fragments; strongly acid; clear wavy boundary.

Bt1—11 to 26 inches; reddish brown (5YR 5/4) channery silty clay loam; moderate medium subangular blocky structure; friable; many distinct clay films on faces of peds; common coarse roots; about 20 percent rock fragments; strongly acid; gradual wavy boundary.

Bt2—26 to 42 inches; reddish brown (5YR 4/4) channery silty clay; moderate medium and coarse subangular blocky structure; friable; many distinct clay films on faces of peds; few coarse roots; about 30 percent rock fragments; strongly acid; gradual wavy boundary.

BC—42 to 52 inches; reddish brown (5YR 4/4) channery silty clay; weak coarse subangular blocky structure; firm; few coarse roots; about 30 percent rock fragments; few medium black and brown concretions; strongly acid; clear wavy boundary.

C—52 to 65 inches; reddish brown (2.5YR 5/4) very channery silty clay; massive; firm; about 40 percent rock fragments; common medium black and brown coatings on faces of peds; strongly acid.

The solum thickness ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. Rock fragments of shale, siltstone, and sandstone range, by volume, from 5 to 15 percent in the A horizon, from 5 to 35 percent in individual subhorizons of the B horizon, and from 20 to 50 percent in the C horizon. Unlimed soils are moderately acid to very strongly acid in the solum and strongly acid to slightly acid in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4.

The BA horizon has hue of 5YR or 7.5YR, value of 4 or

5, and chroma of 3 or 4. Texture of the fine earth material is silt loam or silty clay loam.

The Bt horizon has hue of 5YR, value of 4 or 5, and chroma of 3 to 6. Texture of the fine earth material is silty clay loam or silty clay.

The BC horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. Texture of the fine earth material is silty clay loam or silty clay.

The C horizon has hue of 2.5YR or 5YR, value of 5 or 6, and chroma of 4 to 6. Texture of the fine earth material is silty clay loam or silty clay.

Zoar Series

The Zoar series consists of very deep, moderately well drained soils formed in lacustrine material that washed from acid soils on uplands. These soils are on terraces along smaller streams that are tributaries to the Elk and Little Kanawha Rivers. Slope ranges from 3 to 8 percent.

Zoar soils are on the landscape with the well drained Allegheny, Chavies, and Vandalia soils and the moderately well drained Monongahela soils. Zoar soils contain more clay in the B horizon than Allegheny, Chavies, and Monongahela soils.

Typical pedon of Zoar silt loam, 3 to 8 percent slopes, in a meadow along Granny's Creek about 0.5 mile south of Exit 67 on Interstate 79; USGS Sutton topographic quadrangle; lat. 38 degrees 41 minutes 57 seconds N. and long. 80 degrees 40 minutes 28 seconds W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

BA—8 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many fine roots; very strongly acid; clear wavy boundary.

Bt1—12 to 18 inches; dark yellowish brown (10YR 4/6) silty clay; moderate medium subangular blocky structure; friable; many distinct clay films on faces of peds; many fine roots; very strongly acid; clear wavy boundary.

Bt2—18 to 25 inches; strong brown (7.5YR 5/6) silty clay with common medium distinct light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; friable; many distinct clay films on faces of peds; common fine roots; very strongly acid; clear wavy boundary.

Btg—25 to 34 inches; light gray (10YR 7/2) silty clay with many medium and coarse prominent reddish yellow (7.5YR 7/6) mottles; weak coarse subangular blocky structure; firm; many distinct clay films on faces of peds; few fine roots; very strongly acid; gradual wavy boundary.

Cg—34 to 40 inches; light gray (10YR 7/2) silty clay with many medium prominent reddish yellow (7.5YR 7/6) mottles; weak very coarse platy structure; firm; very strongly acid; gradual wavy boundary.

C1—40 to 50 inches; strong brown (7.5YR 4/6) clay loam with many fine prominent light gray (10YR 7/2) mottles; massive; friable; very strongly acid; gradual wavy boundary.

C2—50 to 65 inches; dark brown (7.5YR 4/4) clay loam with many fine distinct light gray (10YR 7/1) mottles; friable; very strongly acid.

The solum thickness ranges from 34 to 48 inches. The depth to bedrock is more than 60 inches. Unlimed soils are strongly acid or very strongly acid.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The BA horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. Texture of the fine earth material is silt loam or silty clay loam.

The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 6. Texture of the fine earth material is silty clay loam or silty clay.

The C horizon has hue of 5YR to 10YR, value of 4 to 7, and chroma of 4 to 6. Texture of the fine earth material is clay loam, silty clay, or clay.

Formation of the Soils

The origin and development of the soils in Braxton County are explained in this section. The five factors of soil formation are listed and their influence on the soils is described. Morphology of the soils, the processes involved in horizon development, is described as related to horizon nomenclature.

Factors of Soil Formation

The soils in Braxton County have resulted from the interaction of five major factors of soil formation: parent material, time, climate, living organisms, and topography (*4*). Each factor modifies the effectiveness of the others. Parent material, topography, and time have produced the major differences among the soils in Braxton County. Climate and living organisms generally show their influence throughout broad areas, and their effects are relatively uniform throughout the area.

Parent Material, Time, and Climate

The character of the parent material strongly influences the time required for soil formation and the nature of the soil produced. The soils of the county formed in residual, colluvial, and alluvial materials.

Most of the soils formed in residual material weathered from interbedded shale, siltstone, and sandstone. For example, Gilpin soils formed in material weathered from interbedded shale, siltstone, and fine grained sandstone; Lily soils formed in material weathered from sandstone; and Upshur soils formed in material weathered from calcareous shales.

The residual material is the oldest parent material in the county. However, most soils are not as well developed as some of the soils formed in younger material, mainly because the soil-forming processes have been slowed in some areas by clayey material, resistant rock, slope, and soil erosion.

Colluvial material is along foot slopes and near the heads of drainageways. This material moved downslope from the acid and limy residual soils. The Vandalia soils formed in colluvium below the Upshur soils, and the Buchanan soils formed in colluvium below the Gilpin and Lily soils.

The alluvial parent material on terraces and flood plains has washed from acid and limy soils on uplands. The soil-forming processes have had considerable time to act on the material on the terraces. Many additions, losses, and alterations have taken place. The resulting soils, such as Allegheny and Monongahela soils, are strongly leached and have a moderately well developed profile. The alluvial deposits on the flood plains are the youngest parent materials in the county. Most soils on flood plains are poorly developed because the soil-forming processes have had little time to act. Chagrin, Lobdell, Pope, and Sensabaugh soils, for example, are on flood plains.

Climate generally is uniform throughout the survey area. Slight climatic differences exist between the western four-fifths and eastern one-fifth of the county, but the differences are not significant enough to affect soil formation. Therefore, climate is not responsible for major differences in the soil. Rainfall and temperature, however, have a general influence on the development of layers in the soil profile. A detailed description of the climate is given in the section "General Nature of the County."

Living Organisms

All living organisms, including plants, animals, bacteria, fungi, and man, affect soil formation. The kind and amount of vegetation is generally responsible for the amount of organic matter, the color of the surface layer, and, in part, the amount of nutrients present. Earthworms and burrowing animals help to keep the soil open and porous, and they mix organic matter and mineral matter by moving the soil to the surface. Bacteria and fungi decompose organic matter, and some are very instrumental in the weathering and decomposing of minerals, thus releasing nutrients for plant food. Man influences the characteristics of the surface layer of soils through clearing vegetation, plowing, engaging in mining, and other disturbances. Man has added fertilizers and lime and has used management techniques to increase the tilth and productivity of the surface layer.

Topography

Topography affects soil formation by its effect on the amount of water moving through the soil, the amount and rate of runoff, and the rate of erosion.

In gently sloping and strongly sloping areas, a large amount of water has moved through the soils. Water may percolate freely through the soils, as in Gilpin soils; or water movement may be restricted, as in Monongahela soils. On the steep and very steep hillsides, less water moves through the soil and the amount and rate of runoff is greater. The soil material is washed away almost as rapidly as it forms. Thus, the soils on the steeper hillsides likely will be shallower to bedrock than the soils on the gentler slopes.

The topography of Braxton County is favorable for formation of soils on flood plains and terraces, and formation is progressing at a rather rapid rate. Soils on flood plains are weakly developed, mainly because too little time has elapsed since the material was deposited.

Morphology of the Soils

The results of the soil-forming processes can be observed in the different layers, or horizons, in the soil profile. The profile extends from the surface downward to materials that are little changed by the soil-forming processes. Most soils contain three major horizons, called the A, B, and C horizons. These horizons can be further subdivided by the use of numbers and letters to indicate changes within a major horizon.

The A horizon is the surface layer. It is the layer that has the maximum accumulation of organic matter and that shows the maximum leaching, or eluviation, of clay and iron.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. The B horizon commonly has a blocky structure and is generally firmer and lighter in color than the A horizon.

The C horizon is below the A and B horizons. It consists of material that has been modified by weathering but is little altered by the soil-forming processes.

In Braxton County, many processes are involved in the formation of soil horizons. The more important of these are the accumulation of organic matter, the reduction and transfer of iron, the formation and translocation of clay minerals, and the formation of soil structure. Such processes have been continuously taking place for thousands of years.

Most of the well drained soils on uplands in the county have a yellowish brown or weak red B horizon. These colors are caused mainly by the presence of iron oxides. The B horizon of these soils has blocky structure and commonly contains translocated clay materials.

A fragipan has formed in the B horizon of the moderately well drained Buchanan soils on foot slopes and the moderately well drained Monongahela soils on terraces. This layer is dense and brittle, mottled, and slowly permeable or very slowly permeable to water and air. Most fragipans are grayish or mottled with gray.

The moderately well drained soils in the county commonly are gray in color. The gray color resulted from intense reduction of iron during soil formation, in a process called gleying.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recently disturbed lands as a result of mining or construction.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as

Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Carbolith. Dark-colored sedimentary rocks that make a black or very dark (Munsell value of 3 or less) streak or powder. Carbolith includes coal, bone coal, high carbon shales, and high carbon mudstones. In general, this material contains at least 25 percent carbonaceous matter oxidizable at 350-400 degrees C.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowllike area that has steep faces primarily resulting from glacial ice and snow abrasion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Congeliturbate. Soil material disturbed by frost action.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coppice dune. A small dune of fine grained soil material stabilized around shrubs or small trees.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of

the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or

cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a

molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Lithochromic mottles. Mottles that have inherited their color from the parent rocks

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minesoil. A young soil formed in recent earthy materials deposited during deep mining or surface mining of coal.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. An indurated mud having the texture and composition of shale, but lacking the fine lamination of fissility; a blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately the same.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent

Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface

runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. A mudrock that appears dominantly fissile (having a tendency to split along parallel planes into thin layers). These layers must be less than 5mm thick.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop or rise of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 3 percent
Gently sloping	3 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent

Steep	25 to 35 percent
Very steep	35 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-81 at Gassaway, West Virginia)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	43.0	21.7	32.4	71	-10	69	3.46	2.00	4.75	8	9.2
February----	47.0	23.2	35.1	74	-5	86	3.10	1.65	4.37	8	9.3
March-------	57.1	30.5	43.8	84	8	202	3.85	2.47	5.10	9	3.7
April-------	69.6	39.5	54.6	89	20	438	3.87	2.41	5.17	9	.1
May---------	77.4	48.2	62.8	92	29	707	3.96	2.17	5.53	9	.0
June--------	83.2	57.1	70.2	94	40	906	4.43	2.88	5.82	8	.0
July--------	85.8	61.8	73.8	95	48	1,048	5.20	3.28	6.92	9	.0
August------	84.5	61.0	72.8	94	46	1,017	4.27	2.35	5.96	7	.0
September---	79.0	54.6	66.8	93	37	804	3.76	2.14	5.19	7	.0
October-----	68.7	41.7	55.2	85	22	471	3.08	1.38	4.53	6	.1
November----	57.2	32.6	44.9	80	11	174	3.04	1.89	4.06	8	1.5
December----	47.1	25.5	36.3	74	0	92	3.54	1.97	4.92	8	5.3
Yearly:											
Average---	66.6	41.5	54.1	---	---	---	---	---	---	---	---
Extreme---	---	---	---	96	-10	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,014	45.56	39.30	51.12	96	29.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-81 at Gassaway, West Virginia)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 19	Apr. 30	May 12
2 years in 10 later than--	Apr. 15	Apr. 26	May 8
5 years in 10 later than--	Apr. 6	Apr. 18	Apr. 30
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 23	Oct. 13	Oct. 2
2 years in 10 earlier than--	Oct. 28	Oct. 17	Oct. 7
5 years in 10 earlier than--	Nov. 6	Oct. 26	Oct. 15

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-81 at Gassaway, West Virginia)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	193	174	148
8 years in 10	200	180	155
5 years in 10	212	191	167
2 years in 10	225	202	180
1 year in 10	232	208	187

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AgB	Allegheny loam, 3 to 8 percent slopes	740	0.2
BuE	Buchanan channery loam, 15 to 35 percent slopes, extremely stony	28,030	8.5
Cg	Chagrin silt loam	750	0.2
Ch	Chavies fine sandy loam, rarely flooded	1,075	0.3
Cp	Chavies fine sandy loam, protected	775	0.2
Cr	Craigsville gravelly sandy loam	1,150	0.3
GaF	Gilpin silt loam, 35 to 70 percent slopes, very stony	40,220	12.2
GlC	Gilpin-Lily complex, 8 to 15 percent slopes	1,250	0.4
GlD	Gilpin-Lily complex, 15 to 25 percent slopes	7,460	2.3
GlE	Gilpin-Lily complex, 25 to 35 percent slopes	3,425	1.0
GuC	Gilpin-Upshur silt loams, 8 to 15 percent slopes	2,835	0.9
GuD	Gilpin-Upshur silt loams, 15 to 25 percent slopes	34,810	10.5
GuE	Gilpin-Upshur silt loams, 25 to 35 percent slopes	24,205	7.3
GuF	Gilpin-Upshur silt loams, 35 to 70 percent slopes	126,720	38.3
GxF	Gilpin-Upshur silt loams, 35 to 70 percent slopes, extremely bouldery	10,745	3.2
GZF	Gilpin-Pineville association, very steep, extremely stony	4,580	1.4
Lo	Lobdell silt loam	540	0.2
MgB	Monongahela silt loam, 3 to 8 percent slopes	255	0.1
MyE	Myra channery clay loam, steep, very stony	1,355	0.4
Po	Pope sandy loam	1,755	0.5
SoA	Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded	3,190	1.0
SrB	Sensabaugh silt loam, 3 to 8 percent slopes, rarely flooded	3,410	1.0
Ud	Udorthents, smoothed	4,195	1.3
VaC	Vandalia silt loam, 8 to 15 percent slopes	545	0.2
VaD	Vandalia silt loam, 15 to 25 percent slopes	7,180	2.2
VaE	Vandalia silt loam, 25 to 35 percent slopes	7,570	2.3
VxE	Vandalia silt loam, 15 to 35 percent slopes, very stony	8,625	2.6
ZoB	Zoar silt loam, 3 to 8 percent slopes	335	0.1
	Water	2,975	0.9
	Total	330,700	100.0

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AgB	Allegheny loam, 3 to 8 percent slopes
Cg	Chagrin silt loam
Ch	Chavies fine sandy loam, rarely flooded
Cp	Chavies fine sandy loam, protected
Lo	Lobdell silt loam
Po	Pope sandy loam
SoA	Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded
SrB	Sensabaugh silt loam, 3 to 8 percent slopes, rarely flooded

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass
		Bu	Bu	Bu	Tons	Tons	AUM*
AgB------------- Allegheny	IIe	115	75	45	3.5	5.0	5.0
BuE------------- Buchanan	VIIs	---	---	---	---	---	3.0
Cg-------------- Chagrin	IIw	125	80	50	4.0	5.5	5.5
Ch, Cp---------- Chavies	I	125	80	50	4.0	5.5	5.5
Cr-------------- Craigsville	IIs	70	45	25	1.5	2.0	3.5
GaF------------- Gilpin	VIIs	---	---	---	---	---	---
GlC------------- Gilpin-Lily	IIIe	85	60	35	3.0	3.5	4.5
GlD------------- Gilpin-Lily	IVe	80	55	30	2.5	3.0	4.0
GlE------------- Gilpin-Lily	VIe	---	---	---	---	---	3.0
GuC------------- Gilpin-Upshur	IIIe	85	60	35	3.0	3.5	4.5
GuD------------- Gilpin-Upshur	IVe	80	55	30	2.5	3.0	4.0
GuE------------- Gilpin-Upshur	VIe	---	---	---	---	---	3.5
GuF------------- Gilpin-Upshur	VIIe	---	---	---	---	---	---
GxF------------- Gilpin-Upshur	VIIs	---	---	---	---	---	---
GZF------------- Gilpin-Pineville	VIIs	---	---	---	---	---	---
Lo-------------- Lobdell	IIw	120	75	45	3.5	5.0	5.0
MgB------------- Monongahela	IIe	110	65	40	3.0	3.5	4.5
MyE------------- Myra	VIIs	---	---	---	---	---	---
Po-------------- Pope	IIw	110	70	40	3.0	4.5	4.5

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Oats	Wheat	Grass-legume hay	Alfalfa hay	Kentucky bluegrass
		Bu	Bu	Bu	Tons	Tons	AUM*
SoA------------- Sensabaugh	IIw	125	80	50	4.0	5.5	5.5
SrB------------- Sensabaugh	IIe	120	75	45	3.5	5.0	5.0
Ud. Udorthents							
VaC------------- Vandalia	IIIe	95	60	35	3.0	4.5	4.5
VaD------------- Vandalia	IVe	90	55	30	2.5	4.0	4.0
VaE------------- Vandalia	VIe	---	---	---	---	---	3.5
VxE------------- Vandalia	VIIs	---	---	---	---	---	---
ZoB------------- Zoar	IIe	90	65	40	3.0	3.5	4.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	1,850	---	---	---
II	12,125	4,740	6,235	1,150
III	4,630	4,630	---	---
IV	49,450	49,450	---	---
V	---	---	---	---
VI	35,200	35,200	---	---
VII	220,275	126,720	---	93,555
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available. For map units having slopes of more than 15 percent, site index is given for north aspects. Site index on south aspects will generally be 5 to 10 points lower)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Average annual growth: Cubic feet/ac.	Average annual growth: Board feet/ac.	Average annual growth: Cords/ac.
AgB------------- Allegheny	4A	Slight	Slight	Slight	Severe	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	93	95	482	1.10
						Sugar maple---------	---	---	---	---
						White ash-----------	---	---	---	---
						American elm--------	---	---	---	---
						Red maple-----------	---	---	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	70	52	180	0.67
BuE------------- Buchanan	4X	Moderate	Moderate	Slight	Severe	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	90	90	440	1.04
						White oak-----------	---	---	---	---
						Black oak-----------	---	---	---	---
						Basswood------------	---	---	---	---
						Eastern hemlock-----	---	---	---	---
Cg-------------- Chagrin	5A	Slight	Slight	Slight	Severe	Northern red oak----	86	68	292	0.89
						Yellow-poplar-------	96	100	524	1.15
						Sugar maple---------	86	53	---	---
						White oak-----------	---	---	---	---
						Black cherry--------	---	---	---	---
						White ash-----------	---	---	---	---
						Black walnut--------	---	---	---	---
Ch, Cp---------- Chavies	4A	Slight	Slight	Slight	Severe	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	93	95	482	1.10
						Black walnut--------	---	---	---	---
						Black cherry--------	---	---	---	---
						Sugar maple---------	---	---	---	---
						Red maple-----------	---	---	---	---
						Hickory-------------	---	---	---	---
						White oak-----------	---	---	---	---
						American sycamore---	---	---	---	---
Cr-------------- Craigsville	4F	Slight	Slight	Moderate	Moderate	Northern red oak----	75	57	215	0.74
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	---	---
GaF------------- Gilpin	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Black oak-----------	78	60	236	0.78
						Chestnut oak--------	67	49	159	0.63
						Scarlet oak---------	75	57	215	0.74
						White oak-----------	67	49	159	0.63
						Virginia pine-------	71	110	---	---

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity		Average annual growth		
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Plant competi-tion	Common trees	Site index	Cubic feet/ac.	Board feet/ac.	Cords/ac.
GlC*:										
Gilpin---------	4A	Slight	Slight	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Black oak-----------	78	60	236	0.78
						Chestnut oak--------	67	49	159	0.63
						White oak-----------	67	49	159	0.63
						Scarlet oak---------	75	57	215	0.74
						Virginia pine-------	71	110	---	---
Lily-----------	4A	Slight	Slight	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	89	88	428	1.01
						Black oak-----------	80	62	250	0.81
						Chestnut oak--------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
						Virginia pine-------	72	112	---	---
						Scarlet oak---------	--	---	---	---
GlD*, GlE*:										
Gilpin---------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	71	110	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	67	49	159	0.63
						Chestnut oak--------	67	49	159	0.63
						Scarlet oak---------	75	57	215	0.74
						Northern red oak----	78	60	236	0.78
Lily-----------	4R	Moderate	Moderate	Slight	Moderate	Scarlet oak---------	77	59	229	0.77
						Virginia pine-------	80	122	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	73	55	201	0.71
						Chestnut oak--------	73	55	201	0.71
						Yellow-poplar-------	95	98	510	1.14
GuC*:										
Gilpin---------	4A	Slight	Slight	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	71	110	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	67	49	159	0.63
						Chestnut oak--------	67	49	159	0.63
						Scarlet oak	75	57	215	0.74
Upshur---------	3C	Moderate	Slight	Slight	Moderate	Northern red oak----	74	56	208	0.73
						Yellow-poplar-------	80	71	320	0.83
						Eastern white pine--	80	144	---	---
						Virginia pine-------	69	107	---	---
						Black oak-----------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
						Chestnut oak--------	66	48	152	0.61
						Scarlet oak---------	71	53	187	0.68
GuD*:										
Gilpin---------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	80	62	250	---
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	71	110	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	67	49	159	0.63
						Chestnut oak--------	67	49	159	0.63
						Scarlet oak---------	75	57	215	0.74

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Average annual growth: Cubic feet/ac.	Average annual growth: Board feet/ac.	Average annual growth: Cords/ac.
Upshur----------	4R	Moderate	Severe	Slight	Moderate	Northern red oak----	74	56	208	0.73
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	116	---	---
						Virginia pine-------	69	107	---	---
						Black oak-----------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
						Chestnut oak--------	66	48	152	0.61
						Scarlet oak---------	71	53	187	0.68
GuE*:										
Gilpin----------	4R	Moderate	Moderate	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	71	110	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	67	49	159	0.63
						Chestnut oak--------	67	49	159	0.63
						Scarlet oak---------	75	57	215	0.74
Upshur----------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	74	56	208	0.73
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	---	---
						Virginia pine-------	70	109	---	---
						Black oak-----------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
						Chestnut oak--------	66	48	152	0.61
						Scarlet oak---------	71	53	187	0.68
GuF*:										
Gilpin----------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	71	110	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	67	49	159	0.63
						Chestnut oak	67	49	159	0.63
						Scarlet oak	75	57	215	0.74
Upshur----------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	74	56	208	0.73
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	---	---
						Virginia pine-------	70	109	---	---
						Black oak-----------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
						Chestnut oak--------	66	48	152	0.61
						Scarlet oak---------	71	53	187	0.63
GxF*:										
Gilpin----------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Virginia pine-------	71	110	---	---
						Black oak-----------	78	60	236	0.78
						White oak-----------	67	49	159	0.63
						Chestnut oak--------	67	49	159	0.63
						Scarlet oak---------	75	57	215	0.74

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Average annual growth: Cubic feet/ac.	Board feet/ac.	Cords/ac
Upshur----------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	74	56	208	0.73
						Yellow-poplar-------	90	90	440	1.04
						Eastern white pine--	90	166	---	---
						Virginia pine-------	70	109	---	---
						Black oak-----------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
						Chestnut oak--------	66	48	152	0.61
						Scarlet oak---------	71	53	187	0.68
GZF*:										
Gilpin----------	4R	Severe	Severe	Slight	Moderate	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	95	98	510	1.14
						Black oak-----------	78	60	236	0.78
						Basswood------------	---	---	---	---
						Hickory-------------	---	---	---	---
						White oak-----------	67	49	159	0.63
Pineville-------	5R	Severe	Severe	Moderate	Moderate	Northern red oak----	86	68	292	0.89
						Yellow-poplar-------	108	121	692	1.38
						Black oak-----------	85	67	285	0.88
						Basswood------------	---	---	---	---
						Hickory-------------	---	---	---	---
						White oak-----------	---	---	---	---
Lo--------------- Lobdell	5A	Slight	Slight	Slight	Severe	Northern red oak----	87	69	299	0.91
						Yellow-poplar-------	96	100	524	1.15
						Sugar maple---------	---	---	---	---
						White ash-----------	---	---	---	---
						White oak-----------	---	---	---	---
						Black cherry--------	---	---	---	---
						American sycamore---	---	---	---	---
MgB-------------- Monongahela	4A	Slight	Slight	Slight	Severe	Northern red oak----	70	52	180	0.67
						Yellow-poplar-------	80	71	320	0.83
						Eastern white pine--	72	126	---	---
						Virginia pine-------	61	93	---	---
						White ash-----------	---	---	---	---
						Black walnut--------	---	---	---	---
MyE-------------- Myra	4R	Severe	Severe	Moderate	Slight	Northern red oak----	80	62	250	0.81
						Black locust--------	100	---	---	---
						American sycamore---	90	---	---	---
						Sweetgum------------	105	115	650	1.30
						Yellow-poplar-------	---	---	---	---
Po--------------- Pope	4A	Slight	Slight	Slight	Severe	Northern red oak----	80	62	250	0.81
						Yellow-poplar-------	102	110	608	1.27
						American beech------	---	---	---	---
						White oak-----------	70	52	180	0.67
						Blackgum------------	---	---	---	---
						American sycamore---	---	---	---	---
						American basswood---	---	---	---	---
						Eastern hemlock-----	---	---	---	---
						Bitternut hickory---	---	---	---	---
SoA, SrB--------- Sensabaugh	5A	Slight	Slight	Slight	Severe	Northern red oak----	86	68	292	0.89
						Yellow-poplar-------	100	107	580	1.23
						White oak-----------	80	62	250	0.81
						Virginia pine-------	75	115	---	---

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Average annual growth: Cubic feet/ac.	Board feet/ac.	Cords/ac.
VaC-------------	4C	Moderate	Slight	Slight	Severe	Northern red oak----	73	55	201	0.71
Vandalia						Yellow-poplar-------	75	62	265	0.73
						Virginia pine-------	70	109	---	---
						Black oak-----------	74	56	208	0.73
						White oak-----------	69	51	173	0.65
VaD-------------	4R	Moderate	Severe	Slight	Severe	Northern red oak----	77	59	229	0.77
Vandalia						Yellow-poplar-------	90	90	440	1.04
						Virginia pine-------	80	122	---	---
						Black oak-----------	---	---	---	---
						White oak-----------	---	---	---	---
VaE-------------	4R	Severe	Severe	Slight	Severe	Northern red oak----	77	59	229	0.77
Vandalia						Yellow-poplar-------	90	90	440	1.04
						Virginia pine-------	80	122	---	---
						Black oak-----------	---	---	---	---
						White oak-----------	---	---	---	---
VxE-------------	4R	Moderate	Severe	Slight	Severe	Northern red oak----	77	59	229	0.77
Vandalia						Yellow-poplar-------	90	90	440	1.04
						Virginia pine-------	80	122	---	---
						Black oak-----------	---	---	---	---
						White oak-----------	---	---	---	---
ZoB-------------	4W	Slight	Moderate	Slight	Moderate	Northern red oak----	70	52	180	0.67
Zoar						Yellow-poplar-------	80	71	320	0.83
						Virginia pine-------	70	109	---	---
						Eastern white pine--	80	144	---	---
						Black oak-----------	70	52	180	0.67
						White oak-----------	70	52	180	0.67
						Red maple-----------	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

** Average annual growth is equal to total volume growth at rotation divided by rotation age. Actual annual growth varies with stand vigor and other factors. Yield data are based on site indices of natural stands at age 50 using the International 1/4 log rule and standard rough cords. This information should be used for planning only.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AgB------------------- Allegheny	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
BuE------------------- Buchanan	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Cg-------------------- Chagrin	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
Ch-------------------- Chavies	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
Cp-------------------- Chavies	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
Cr-------------------- Craigsville	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight----------	Moderate: small stones.
GaF------------------- Gilpin	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
GlC*:					
Gilpin---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Lily-----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
GlD*:					
Gilpin---------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lily-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
GlE*:					
Gilpin---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lily-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GuC*:					
Gilpin---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Upshur---------------	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GuD*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GuE*, GuF*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
GxF*:					
Gilpin	Severe: slope. large stones.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: slope.
Upshur	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: slope, erodes easily.	Severe: slope.
GZF:					
Gilpin	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Pineville	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
Lo Lobdell	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: flooding, wetness.
MgB Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: slope, depth to cemented pan	Slight	Moderate: depth to cemented pan
MyE Myra	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Po Pope	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
SoA Sensabaugh	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
SrB Sensabaugh	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
Ud. Udorthents					

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VaC------------------- Vandalia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
VaD------------------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VaE------------------- Vandalia	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
VxE------------------- Vandalia	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope, erodes easily.	Severe: slope.
ZoB------------------- Zoar	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
AgB----------------- Allegheny	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BuE----------------- Buchanan	Very poor.	Very poor.	Good	Good	Good	Poor	Very poor.	Poor	Fair	Very poor.
Cg------------------ Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ch, Cp-------------- Chavies	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Cr------------------ Craigsville	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
GaF----------------- Gilpin	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GlC*:										
Gilpin-------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Lily---------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GlD*:										
Gilpin-------------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Lily---------------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GlE*:										
Gilpin-------------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Lily---------------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GuC*:										
Gilpin-------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Upshur-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GuD*:										
Gilpin-------------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
GuE*: Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
GuE*: Upshur	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GuF*: Gilpin	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
GxF*: Gilpin	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
GZF: Gilpin	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Pineville	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Lo Lobdell	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MgB Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MyE Myra	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Po Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SoA Sensabaugh	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SrB Sensabaugh	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ud. Udorthents										
VaC Vandalia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
VaD Vandalia	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VaE Vandalia	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
VxE----------------- Vandalia	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
ZoB----------------- Zoar	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AgB: Allegheny	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
BuE: Buchanan	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Cg: Chagrin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Ch: Chavies	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Cp: Chavies	Slight	Slight	Slight	Slight	Slight	Slight.
Cr: Craigsville	Severe: cutbanks cave, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: large stones.	Moderate: small stones.
GaF: Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GlC*:						
Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Lily	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
GlD*, GlE*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lily	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
GuC*:						
Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Upshur	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, low strength.	Moderate: slope.
GuD*, GuE*, GuF*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GuD*, GuE*, GuF*:						
Upshur-----------	Severe: slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, slippage.	Severe: slope, shrink-swell, low strength, slippage.	Severe: slope.
GxF*:						
Gilpin-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur-----------	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell, slippage.	Severe: slope.
GZF*:						
Gilpin-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pineville--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lo---------------- Lobdell	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding, wetness.
MgB--------------- Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Moderate: depth to cemented pan.
MyE--------------- Myra	---	---	---	---	---	---
Po---------------- Pope	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
SoA--------------- Sensabaugh	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
SrB--------------- Sensabaugh	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Ud. Udorthents						
VaC--------------- Vandalia	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope, slippage.	Severe: low strength, shrink-swell.	Moderate: slope.
VaD, VaE, VxE----- Vandalia	Severe: slope, slippage.	Severe: shrink-swell, slope, slippage.	Severe: slope, shrink-swell, slippage.	Severe: shrink-swell, slope, slippage.	Severe: low strength, slope, shrink-swell, slippage.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ZoB--------------- Zoar	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the" Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AgB----------------- Allegheny	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
BuE----------------- Buchanan	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: wetness, slope.	Severe: slope, wetness.	Poor: slope, thin layer, cemented pan.
Cg------------------ Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: thin layer.
Ch------------------ Chavies	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Cp------------------ Chavies	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Cr------------------ Craigsville	Severe: poor filter, large stones.	Severe: seepage, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: seepage, large stones.
GaF----------------- Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
GlC*:					
Gilpin-------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer, depth to rock.
Lily---------------	Severe: depth to rock.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, thin layer depth to rock.
GlD*, GlE*:					
Gilpin-------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer. depth to rock.
Lily---------------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope, area reclaim, thin layer.
GuC*:					
Gilpin-------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Upshur	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
GuD*, GuE*, GuF*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer, depth to rock.
Upshur	Severe: slope, percs slowly, slippage.	Severe: slope, slippage.	Severe: slope, too clayey, depth to rock, slippage.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
GxF*:					
Gilpin	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Upshur	Severe: percs slowly, slope, slippage.	Severe: slope, slippage.	Severe: slippage, slope, too clayey, depth to rock.	Severe: slope, slippage.	Poor: slope, too clayey, hard to pack.
GZF*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope, area reclaim.
Pineville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lo Lobdell	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness,	Severe: flooding, wetness.	Fair: wetness, thin layer.
MgB Monongahela	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: wetness, thin layer.
MyE Myra	---	---	---	---	---
Po Pope	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: thin layer.
SoA Sensabaugh	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: small stones.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SrB----------------- Sensabaugh	Moderate: flooding, wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Poor: small stones.
Ud. Udorthents					
VaC----------------- Vandalia	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
VaD, VaE, VxE-------- Vandalia	Severe: slope, percs slowly, slippage.	Severe: slope, slippage.	Severe: slope, too clayey, slippage.	Severe: slope, slippage.	Poor: too clayey, hard to pack, slope.
ZoB----------------- Zoar	Severe: percs slowly, wetness.	Severe: wetness.	Severe: too clayey, wetness.	Moderate: wetness.	Poor: too clayey, hard to pack, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AgB------------------- Allegheny	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BuE------------------- Buchanan	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, area reclaim, small stones.
Cg-------------------- Chagrin	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Ch, Cp---------------- Chavies	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Cr-------------------- Craigsville	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
GaF------------------- Gilpin	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GlC*:				
Gilpin---------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Lily-----------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope, depth to rock.
GlD*:				
Gilpin---------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Lily-----------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GlE*:				
Gilpin---------------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Lily-----------------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GuC*:				
Gilpin	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GuD*:				
Gilpin	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Upshur	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
GuE*, GuF*:				
Gilpin	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Upshur	Poor: slope, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
GxF*:				
Gilpin	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, large stones, small stones.
Upshur	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
GZF*:				
Gilpin	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Pineville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Severe: small stones, slope.
Lo Lobdell	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
MgB Monongahela	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MyE Myra	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Po Pope	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SoA, SrB: Sensabaugh	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Ud. Udorthents				
VaC: Vandalia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
VaD: Vandalia	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
VaE, VxE: Vandalia	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
ZoB: Zoar	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
AgB--------------- Allegheny	Moderate: seepage, slope.	Severe: piping.	Deep to water, slope.	Favorable--------	Favorable.
BuE--------------- Buchanan	Severe: slope.	Severe: piping.	Percs slowly, slope.	Slope, percs slowly, rooting depth.	Slope, percs slowly, rooting depth.
Cg---------------- Chagrin	Moderate: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
Ch, Cp------------ Chavies	Severe: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
Cr---------------- Craigsville	Severe: seepage.	Severe: seepage, large stones.	Deep to water----	Large stones, too sandy.	Large stones, droughty.
GaF--------------- Gilpin	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
GlC*:					
Gilpin-----------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Lily-------------	Severe: slope, seepage.	Severe: piping.	Deep to water, slope.	Depth to rock, slope, large stones.	Slope, depth to rock, large stones.
GlD*:					
Gilpin-----------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Lily-------------	Severe: seepage, slope.	Severe: piping.	Deep to water, slope.	Slope, depth to rock, large stones.	Slope, depth to rock. large stones.
GlE*:					
Gilpin-----------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Lily-------------	Severe: seepage, slope.	Severe: piping.	Deep to water, slope.	Slope, depth to rock. large stones.	Slope, depth to rock. large stones.
GuC*, GuD*, GuE*, GuF*:					
Gilpin----------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
GuC*, GuD*, GuE*, GuF*:					
Upshur----------	Severe: slope, slippage.	Severe: hard to pack.	Deep to water, slope, slippage.	Slope, erodes easily, percs slowly, slippage.	Slope, erodes easily, percs slowly.
GxF*:					
Gilpin-----------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Upshur-----------	Severe: slope, slippage.	Severe: hard to pack.	Deep to water, slope, slippage.	Slope, erodes easily, percs slowly, slippage.	Slope, erodes easily, percs slowly.
GZF*:					
Gilpin-----------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Pineville--------	Severe: slope.	Severe: piping.	Deep to water, slope.	Slope, large stones.	Slope, large stones.
Lo---------------- Lobdell	Moderate: seepage.	Severe: piping.	Frost action-----	Erodes easily, wetness.	Erodes easily.
MgB--------------- Monongahela	Moderate: slope.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
MyE--------------- Myra	Severe: slope.	Severe: large stones.	Deep to water, slope.	Slope, large stones.	Large stones, slope.
Po---------------- Pope	Severe: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
SoA--------------- Sensabaugh	Severe: seepage.	Severe: large stones, piping.	Deep to water----	Large stones-----	Large stones.
SrB--------------- Sensabaugh	Severe: seepage.	Severe: large stones, piping.	Deep to water, slope.	Large stones-----	Large stones.
Ud. Udorthents					
VaC, VaD, VaE, VxE-------------- Vandalia	Severe: slope, slippage.	Moderate: hard to pack.	Deep to water, slope.	Slope, erodes easily, large stones.	Slope, erodes easily, percs slowly, large stones.
ZoB--------------- Zoar	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AgB-------------- Allegheny	0-7	Loam-------------	ML, CL	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	7-43	Clay loam, cobbly clay loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	43-65	Clay loam, sandy loam, sandy clay loam.	SM, GC, ML, CL	A-4, A-6, A-2, A-1	0-5	65-100	55-100	35-95	20-75	<35	NP-15
BuE-------------- Buchanan	0-4	Extremely stony loam.	GM, ML, CL, CL-ML	A-2, A-4	5-20	50-85	45-70	40-70	30-60	20-35	2-11
	4-25	Loam, channery loam, channery clay loam.	GM, ML, CL, SM	A-2, A-4	0-20	50-100	45-90	40-90	20-80	20-35	2-15
	25-65	Channery loam, channery sandy clay loam, very channery sand loam.	GM, ML, CL, SM	A-2, A-4, A-6	0-20	50-100	30-80	30-75	20-60	20-35	2-15
Cg--------------- Chagrin	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	8-35	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	35-65	Stratified silt loam to gravelly fine sand.	ML, SM, SP-SM	A-4, A-2	0	75-100	65-100	40-85	10-80	20-40	NP-10
Ch, Cp----------- Chavies	0-12	Fine sandy loam--	SM, ML, CL-ML, SM-SC	A-4	0	85-100	75-100	40-90	40-75	<25	NP-5
	12-36	Fine sandy loam, silt loam, loam.	SM, ML	A-4	0	85-100	75-100	65-100	45-85	<35	NP-8
	36-65	Fine sandy loam, sandy loam, loam.	SM, ML, CL-ML, SM-SC	A-4, A-2, A-1-B	0-5	70-100	60-95	40-85	20-75	<25	NP-5
Cr--------------- Craigsville	0-6	Gravelly sandy loam.	ML, SM, CL-ML, SC	A-2, A-4	0-25	65-90	60-85	40-75	25-60	<25	NP-10
	6-35	Extremely cobbly sandy loam, very cobbly loam, very gravelly sandy loam.	SM, GM, GC, SC	A-1, A-2, A-4	25-60	50-80	30-65	25-60	15-40	<25	NP-10
	35-65	Very gravelly loamy sand, very gravelly sandy loam, extremely cobbly loamy sand.	GC, GM, GP-GM, GM-GC	A-1, A-2	35-75	35-55	30-50	20-45	10-25	<25	NP-8

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
GaF-------------- Gilpin	0-3	Very stony silt loam.	GC, CL, SC, CL-ML	A-2, A-4, A-6	10-40	50-90	45-85	35-75	30-70	20-40	4-15
	3-24	Silt loam, channery silty clay loam.	GM-GC, CL, CL-ML, SC	A-2, A-4, A-5	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-31	Channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-5	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GlC*:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-24	Silt loam, channery silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-31	Channery loam, channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lily------------	0-6	Loam-------------	ML, CL-ML	A-4	0-5	90-100	85-100	70-95	55-80	<35	NP-10
	6-23	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	23-27	Sandy clay loam, clay loam, channery clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-B	0-10	65-100	50-100	40-95	20-75	<35	3-15
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GlD*, GlE*:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-24	Silt loam, channery silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-31	Channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Lily------------	0-6	Loam-------------	ML, CL-ML	A-4	0-5	90-100	85-100	70-95	55-80	<35	NP-10
	6-23	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	23-27	Sandy clay loam, clay loam, channery clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1-B	0-10	65-100	50-100	40-95	20-75	<35	3-15
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GuC*, GuD*, GuE*, GuF*:											
Gilpin----------	0-3	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	3-24	Silt loam, channery silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-31	Channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-2	Silt loam--------	CL-ML, ML, CL	A-6, A-4	0	95-100	95-100	85-100	65-90	25-40	5-15
	2-32	Silty clay loam, silty clay, clay.	MH, CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
	32-43	Very channery silty clay loam.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	43	Weathered bedrock.	---	---	---	---	---	---	---	---	---
GxF*:											
Gilpin----------	0-3	Extremely bouldery silt loam.	GC, CL, SC, CL-ML	A-2, A-4, A-6	10-40	50-90	45-85	35-75	30-70	20-40	4-15
	3-24	Silt loam, channery silty clay loam, silty clay loam.	GM-GC, CL, CL-ML, SC	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-31	Channery silt loam, channery silty clay loam, channery loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-2	Extremely bouldery silt loam.	CL-ML, CL, ML	A-4, A-6	3-10	95-100	95-100	85-100	65-90	25-40	5-15
	2-32	Silty clay, clay, silty clay loam.	MH, CH, CL	A-7	0	85-100	75-100	70-100	65-100	45-70	20-40
	32-43	Very channery silty clay loam.	CL, ML, MH, CH	A-6, A-7	0	80-100	65-100	60-100	55-95	35-55	11-25
	43	Weathered bedrock.	---	---	---	---	---	---	---	---	---
GZF*:											
Gilpin----------	0-3	Extremely stony silt loam.	GC, CL, SC, CL-ML	A-2, A-4, A-6	10-40	50-90	45-85	35-75	30-70	20-40	4-15
	3-24	Silt loam, channery silty clay loam.	GM-GC, CL, CL-ML, SC	A-2, A-4, A-5	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	24-31	Channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-5	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GZF*:											
Pineville-------	0-5	Extremely stony loam.	ML, CL-ML, SM, SM-SC	A-2, A-4	3-15	55-90	50-85	45-80	30-75	25-35	4-10
	5-60	Channery loam, channery clay loam, very channery loam.	CL, CL-ML, SC, SM-SC	A-2, A-4, A-6	0-10	55-85	50-80	45-75	30-65	25-40	6-15
	60-65	Very channery loam, very channery clay loam, very channery sandy loam.	GM, GM-GC, SC, SM-SC	A-1, A-2, A-4, A-6	5-20	35-75	30-70	25-65	20-60	25-35	4-12
Lo--------------- Lobdell	0-8	Silt loam--------	ML, CL-ML, CL	A-4	0	95-100	90-100	80-100	65-90	20-30	NP-8
	8-32	Loam, silt loam	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
	32-65	Stratified sandy loam to silt loam.	ML, SM, CL-ML, CL	A-4	0	90-100	80-100	65-85	40-80	15-35	NP-10
MgB-------------- Monongahela	0-10	Silt loam--------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	10-24	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	24-58	Silty clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
	58-65	Silty clay loam, gravelly sandy loam.	ML, CL, SM, SC	A-4, A-6	10-20	75-100	60-90	60-85	40-85	20-40	1-15
MyE-------------- Myra	0-6	Very stony clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1-B	5-25	40-65	30-50	25-45	20-40	25-40	5-15
	6-65	Very channery clay loam, very stony clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1-B	5-30	40-60	30-50	25-45	20-45	25-40	5-15
Po--------------- Pope	0-5	Sandy loam-------	SM, ML, CL-ML, SM-SC	A-2, A-4	0	85-100	75-100	51-85	25-55	<20	NP-5
	5-40	Fine sandy loam, sandy loam, loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	95-100	80-100	51-95	25-75	<30	NP-7
	40-65	Sandy loam, loamy sand, sandy clay loam.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-20	45-100	35-100	30-95	15-70	<30	NP-7
SoA, SrB--------- Sensabaugh	0-7	Silt loam--------	CL-ML, CL, ML	A-4	0-5	90-100	75-95	65-85	55-75	16-29	3-9
	7-29	Loam, gravelly clay loam, gravelly silty clay loam.	CL-ML, CL, SM-SC, GC	A-4, A-6	2-18	70-95	55-90	45-75	35-65	20-35	5-14
	29-65	Very gravelly sandy clay loam, very gravelly loam.	SM-SC, SC, GM-GC, GC	A-4, A-6, A-2	5-30	55-90	25-75	25-65	20-55	20-36	6-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ud. Udorthents											
VaC, VaD, VaE---- Vandalia	0-6	Silt loam--------	ML, CL	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-90	25-45	5-20
	6-52	Silt loam, channery silty clay loam, channery silty clay, clay.	CL, CH, ML	A-6, A-7	0-5	75-100	70-95	65-90	60-85	35-55	15-30
	52-65	Very channery silty clay, clay, channery silty clay loam.	CL, CH, ML, MH	A-6, A-7	0-5	70-100	65-100	60-100	55-100	30-55	10-30
VxE-------------- Vandalia	0-6	Very stony silt loam.	ML, CL	A-4, A-6, A-7	2-15	65-95	60-80	55-75	55-65	25-45	5-20
	6-52	Silt loam, channery silty clay loam, channery silty clay.	MH, CL, CH, ML	A-6, A-7	0-5	70-100	70-95	65-90	60-85	35-55	15-30
	52-65	Very channery silty clay, clay, silty clay loam.	MH, CH, CL, ML	A-6, A-7	0-5	70-100	65-100	60-100	55-100	30-55	10-30
ZoB-------------- Zoar	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	75-95	20-40	3-15
	8-34	Silt loam, silty clay, silty clay loam.	CL, CH, ML, MH	A-6, A-7	0	95-100	95-100	90-100	85-100	30-55	11-32
	34-65	Clay loam, silty clay, clay.	CL, CH, ML, MH	A-6, A-7	0	95-100	95-100	90-100	75-95	30-60	11-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
AgB--------------	0-7	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low-----------	0.32	4	1-4
Allegheny	7-43	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low-----------	0.28		
	43-65	10-35	1.20-1.40	0.6-2.0	0.08-0.17	3.6-5.5	Low-----------	0.28		
BuE--------------	0-4	10-27	1.20-1.40	0.6-2.0	0.11-0.16	3.6-5.5	Low-----------	0.24	3	---
Buchanan	4-25	18-30	1.30-1.60	0.6-2.0	0.10-0.16	3.6-5.5	Low-----------	0.24		
	25-65	18-35	1.40-1.70	0.06-0.2	0.06-0.10	3.6-5.5	Low-----------	0.17		
Cg---------------	0-8	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.32	5	2-4
Chagrin	8-35	18-30	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low-----------	0.32		
	35-65	5-25	1.20-1.40	0.6-2.0	0.08-0.20	5.6-7.3	Low-----------	0.32		
Ch, Cp-----------	0-12	7-18	1.20-1.40	2.0-6.0	0.11-0.18	5.1-6.5	Low-----------	0.24	4	.5-4
Chavies	12-36	7-18	1.20-1.40	2.0-6.0	0.11-0.20	5.1-6.5	Low-----------	0.24		
	36-65	7-18	1.30-1.50	2.0-6.0	0.08-0.18	4.5-6.0	Low-----------	0.24		
Cr---------------	0-6	5-15	1.20-1.40	2.0-6.0	0.07-0.15	4.5-5.5	Low-----------	0.17	3	1-5
Craigsville	6-35	5-15	1.30-1.60	2.0-6.0	0.06-0.15	4.5-5.5	Low-----------	0.17		
	35-65	5-10	1.35-1.55	>6.0	0.04-0.09	4.5-5.5	Low-----------	0.17		
GaF--------------	0-3	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low-----------	0.24	3	.5-4
Gilpin	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----------	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----------	0.24		
	31	---	---	---	---	---	-------------	--		
GlC*:										
Gilpin-----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----------	0.32	3	.5-4
	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----------	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----------	0.24		
	31	---	---	---	---	---	-------------	--		
Lily-------------	0-6	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low-----------	0.28	2	.5-4
	6-23	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low-----------	0.28		
	23-27	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low-----------	0.17		
	27	---	---	---	---	---	-------------	--		
GlD*, GlE*:										
Gilpin-----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----------	0.32	3	.5-4
	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----------	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----------	0.24		
	31	---	---	---	---	---	-------------	--		
Lily-------------	0-6	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low-----------	0.28	2	.5-4
	6-23	18-35	1.25-1.35	2.0-6.0	0.12-0.18	3.6-5.5	Low-----------	0.28		
	23-27	20-35	1.25-1.35	2.0-6.0	0.08-0.17	3.6-5.5	Low-----------	0.17		
	27	---	---	---	---	---	-------------	--		
GuC*, GuD*, GuE*, GuF*:										
Gilpin----------	0-3	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----------	0.32	3	.5-4
	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----------	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----------	0.24		
	31	---	---	---	---	---	-------------	--		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
GuC*, GuD*, GuE*, GuF*:										
Upshur	0-2	15-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Moderate	0.43	3	1-4
	2-32	40-55	1.30-1.60	0.06-0.2	0.10-0.14	5.1-7.8	High	0.32		
	32-43	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-7.8	Moderate	0.32		
	43	---	---	---	---	---	-------------	--		
GxF*:										
Gilpin	0-3	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low	0.24	3	.5-4
	3-24	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24		
	31	---	---	---	---	---	-------------	--		
Upshur	0-2	15-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Moderate	0.37	3	1-4
	2-32	40-55	1.30-1.60	0.06-0.2	0.10-0.14	5.1-7.8	High	0.32		
	32-43	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-7.8	Moderate	0.32		
	43	---	---	---	---	---	-------------	--		
GZF*:										
Gilpin	0-3	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low	0.24	3	.5-4
	3-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low	0.24		
	24-31	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low	0.24		
	31	---	---	---	---	---	-------------	--		
Pineville	0-5	15-25	1.00-1.30	0.6-2.0	0.12-0.18	4.5-6.5	Low	0.20	4	.5-5
	5-60	18-30	1.30-1.60	0.6-2.0	0.08-0.14	4.5-5.5	Low	0.15		
	60-65	15-30	1.30-1.60	0.6-6.0	0.06-0.14	4.5-5.5	Low	0.15		
Lo Lobdell	0-8	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	1-3
	8-32	18-30	1.25-1.60	0.6-2.0	0.17-0.22	5.6-7.3	Low	0.37		
	32-65	15-30	1.20-1.60	0.6-6.0	0.12-0.18	5.6-7.3	Low	0.37		
MgB Monongahela	0-10	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-5.5	Low	0.43	3	2-4
	10-24	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low	0.43		
	24-58	18-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low	0.43		
	58-65	10-35	1.20-1.40	0.2-0.6	0.08-0.12	4.5-5.5	Low	0.37		
MyE Myra	0-6	12-30	1.40-1.65	0.2-2.0	0.08-0.16	6.1-8.4	Low	0.32	5	<1
	6-65	12-30	1.40-1.80	0.2-2.0	0.05-0.16	7.4-8.4	Low	0.32		
Po Pope	0-5	5-15	1.20-1.40	2.0-6.0	0.10-0.16	3.6-5.5	Low	0.28	5	1-4
	5-40	5-18	1.30-1.60	0.6-6.0	0.10-0.18	3.6-5.5	Low	0.28		
	40-65	5-20	1.30-1.60	0.6-6.0	0.10-0.18	3.6-5.5	Low	0.28		
SoA, SrB Sensabaugh	0-7	8-25	1.25-1.40	0.6-6.0	0.12-0.18	5.6-7.8	Low	0.24	5	1-3
	7-29	18-35	1.30-1.50	0.6-6.0	0.10-0.16	5.6-7.8	Low	0.20		
	29-65	12-38	1.25-1.50	0.6-6.0	0.08-0.14	5.6-7.8	Low	0.17		
Ud. Udorthents										
VaC, VaD, VaE Vandalia	0-6	20-35	1.20-1.50	0.2-2.0	0.12-0.18	4.5-6.0	Moderate	0.37	4	1-3
	6-52	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-6.0	High	0.32		
	52-65	27-50	1.30-1.60	0.06-0.6	0.08-0.12	5.1-6.5	High	0.32		
VxE Vandalia	0-6	20-35	1.20-1.50	0.2-2.0	0.12-0.18	4.5-6.0	Moderate	0.32	4	1-3
	6-52	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-6.0	High	0.32		
	52-65	27-50	1.30-1.60	0.06-0.6	0.08-0.12	5.1-6.5	High	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
ZoB---------------	0-8	15-30	1.20-1.40	0.6-2.0	0.15-0.18	4.5-5.5	Low-----------	0.43	3	1-4
Zoar	8-34	35-50	1.30-1.60	0.06-0.6	0.12-0.15	4.5-5.5	Moderate-----	0.32		
	34-65	35-50	1.40-1.70	0.06-0.2	0.08-0.12	4.5-5.5	Moderate-----	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the te
The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a cor
or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of cor	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Co
			Ft			In				
AgB--------------- Allegheny	B	None------------	>6.0	---	---	>60	---	---	Low------	Hi
BuE--------------- Buchanan	C	None------------	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate	High-----	Hi
Cg---------------- Chagrin	B	Occasional------	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low------	Mo
Ch---------------- Chavies	B	Rare------------	>6.0	---	---	>60	---	---	Low------	Mo
Cp---------------- Chavies	B	None------------	>6.0	---	---	>60	---	---	Low------	Mo
Cr---------------- Craigsville	B	Rare------------	>6.0	---	---	>60	---	Moderate	Low------	Mo
GaF--------------- Gilpin	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	Hi
GlC*:										
Gilpin-----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	H
Lily-------------	B	None------------	>6.0	---	---	20-40	Hard	Moderate	Moderate	H
GlD*, GlE*:										
Gilpin-----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	H
Lily-------------	B	None------------	>6.0	---	---	20-40	Hard	Moderate	Moderate	H
GuC*, GuD*, GuE*, GuF*, GxF*:										
Gilpin----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	H
Upshur----------	D	None------------	>6.0	---	---	>40	Soft	Moderate	High-----	M

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding	High water table			Bedrock		Potential frost action	Risk of co	
		Frequency	Depth	Kind	Months	Depth	Hardness		Uncoated steel	C
			Ft			In				
GZF*:										
Gilpin----------	C	None------------	>6.0	---	---	20-40	Soft	Moderate	Low------	H
Pineville--------	B	None------------	>6.0	---	---	>60	---	Moderate	Low------	H
Lo--------------- Lobdell	B	Occasional------	1.5-3.5	Apparent	Dec-Apr	>60	---	High-----	Low------	M
MgB-------------- Monongahela	C	None------------	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High-----	H
MyE-------------- Myra	C	None------------	>6.0	---	---	>60	---	Moderate	Low------	L
Po--------------- Pope	B	Occasional------	4.0-6.0	Apparent	---	>60	---	Moderate	Low------	H
SoA-------------- Sensabaugh	B	Occasional------	4.0-6.0	Apparent	Jan-Apr	>60	---	---	Low------	L
SrB-------------- Sensabaugh	B	Rare------------	4.0-6.0	Apparent	Jan-Apr	>60	---	---	Low------	L
Ud. Udorthents										
VaC, VaD, VaE, VxE------------- Vandalia	D	None------------	>6.0	---	---	>60	---	Moderate	High-----	M
ZoB-------------- Zoar	C	None------------	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	High-----	H

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Buchanan	Fine-loamy, mixed, mesic Aquic Fragiudults
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Chavies	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Craigsville	Loamy-skeletal, mixed, mesic Fluventic Dystrochrepts
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Lobdell	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Myra	Loamy-skeletal, mixed (calcareous), mesic Typic Udorthents
Pineville	Fine-loamy, mixed, mesic Typic Hapludults
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Sensabaugh	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Udorthents	Udorthents
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandalia	Fine, mixed, mesic Typic Hapludalfs
Zoar	Clayey, mixed, mesic Aquic Hapludults

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All Other Inquiries

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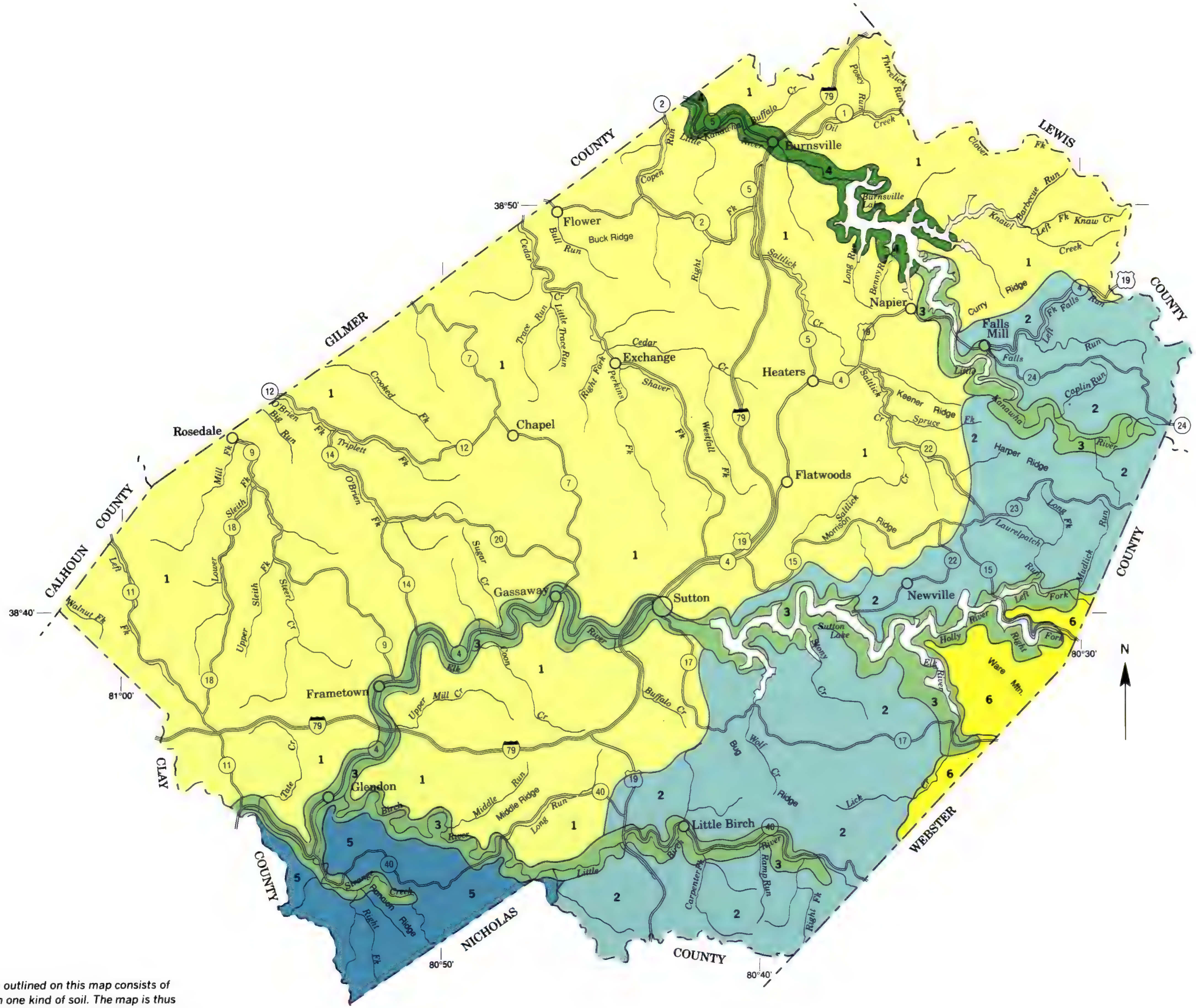


SOIL LEGEND*

1	GILPIN-UPSHUR-VANDALIA
2	GILPIN-BUCHANAN-LILY
3	BUCHANAN-CHAVIES-POPE
4	VANDALIA-CHAVIES-POPE
5	GILPIN-UPSHUR-BUCHANAN
6	GILPIN-BUCHANAN-PINEVILLE

* The units on this legend are described in the text under the heading "General Soil Map Units."

Compiiled 1996

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
WEST VIRGINIA AGRICULTURAL AND FORESTRY EXPERIMENT STATION
BRAXTON COUNTY COMMISSION

GENERAL SOIL MAP

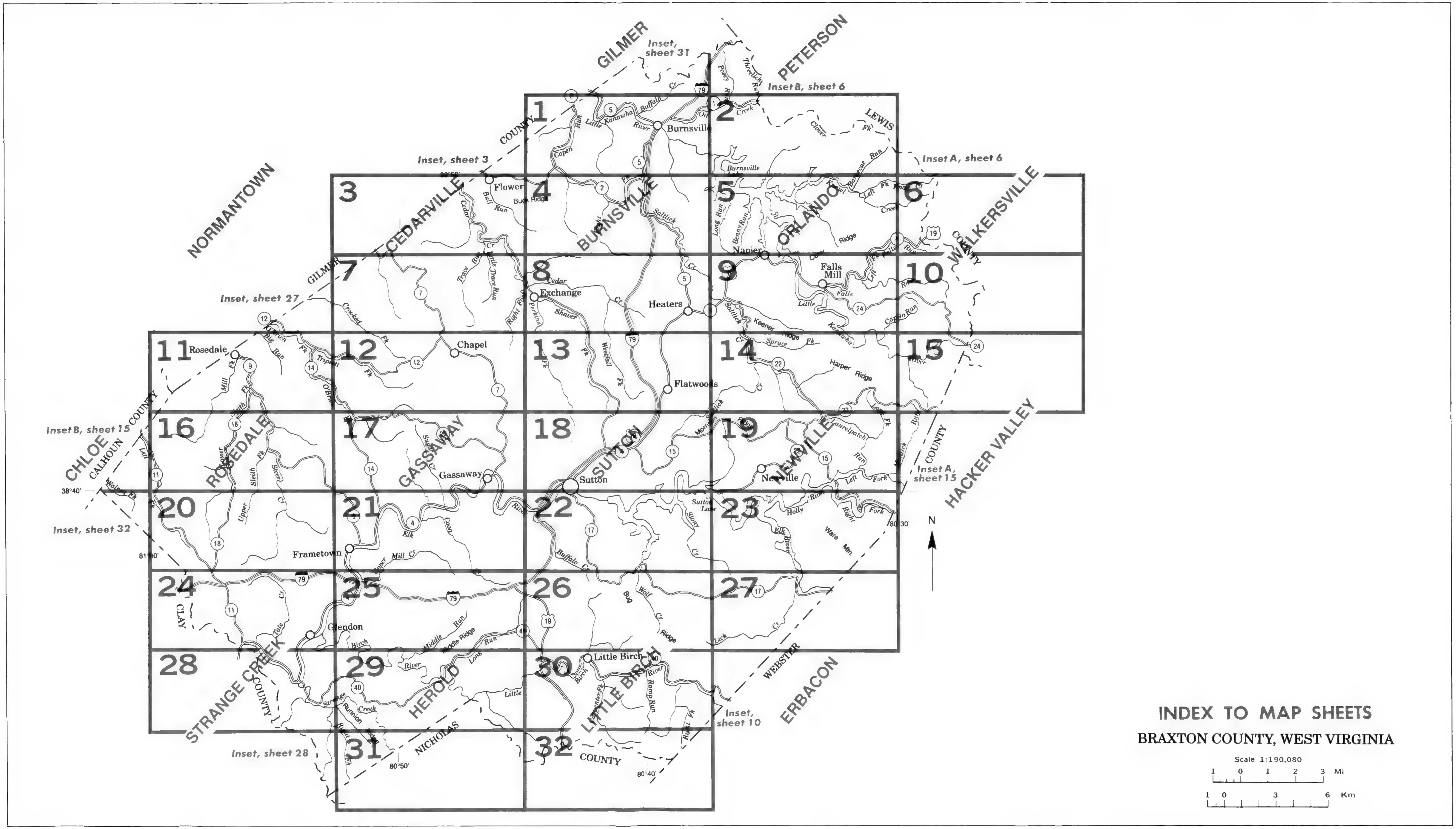
BRAXTON COUNTY, WEST VIRGINIA

Scale 1:190,080

1 0 1 2 3 Mi

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
BRAXTON COUNTY, WEST VIRGINIA
Scale 1:190,080
1 0 1 2 3 Mi
1 0 3 6 Km
N
GILMER COUNTY
PETERSON
LEWIS
NORMANTOWN
CEDARVILLE
BURNSVILLE
ORLANDO
WALKERSVILLE
CHLOE
CALHOUN COUNTY
ROSEDALE
GASSAWAY
SUTTON
NEWVILLE
HACKER VALLEY
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CLAY COUNTY
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LITTLE BIRCH
ERBACON
WEBSTER COUNTY
NICHOLAS COUNTY
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Inset, sheet 32
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Burnsville
Flower
Napier
Falls Mill
Exchange
Heaters
Rosedale
Chapel
Flatwoods
Gassaway
Sutton
Newville
Frametown
Glendon
Little Birch
38°40'
81°00'
80°30'
80°50'
80°40'

SOIL LEGEND

Publication symbols consist of a combination of letters (e.g., BuE, Cg, GuF). The first letter, always a capital, is the initial letter of the map unit name. The second letter (usually lowercase) separates map units having names that begin with the same letter, except that it does not separate slope phases. The second letter is capitalized for those map units that are associations. The third letter, always a capital B, C, D, E, or F, indicates the slope. Symbols without a slope letter are for nearly level soils, soils named for categories above the series that have variable slope ranges, or for miscellaneous areas. A number 3 following the slope letter indicates that the soils is severely eroded.

SYMBOL	NAME
AgB	Allegheny loam, 3 to 8 percent slopes
BuE	Buchanan channery loam, 15 to 35 percent slopes, extremely stony
Cg	Chagrin silt loam
Ch	Chavies fine sandy loam, rarely flooded
Cp	Chavies fine sandy loam, protected
Cr	Craigsville gravelly sandy loam
GaF	Gilpin silt loam, 35 to 70 percent slopes, very stony
GlC	Gilpin-Lily complex, 8 to 15 percent slopes
GlD	Gilpin-Lily complex, 15 to 25 percent slopes
GlE	Gilpin-Lily complex, 25 to 35 percent slopes
GuC	Gilpin-Upshur silt loams, 8 to 15 percent slopes
GuD	Gilpin-Upshur silt loams, 15 to 25 percent slopes
GuE	Gilpin-Upshur silt loams, 25 to 35 percent slopes
GuF	Gilpin-Upshur silt loams, 35 to 70 percent slopes
GxF	Gilpin-Upshur silt loams, 35 to 70 percent slopes, extremely bouldery
GZF	Gilpin-Pineville association, very steep, extremely stony
Lo	Lobdell silt loam
MgB	Monongahela silt loam, 3 to 8 percent slopes
MyE	Myra channery clay loam, steep, very stony
Po	Pope sandy loam
SoA	Sensabaugh silt loam, 0 to 3 percent slopes, occasionally flooded
SrB	Sensabaugh silt loam, 3 to 8 percent slopes, rarely flooded
Ud	Udorthents, smoothed
VaC	Vandalia silt loam, 8 to 15 percent slopes
VaD	Vandalia silt loam, 15 to 25 percent slopes
VaE	Vandalia silt loam, 25 to 35 percent slopes
VxE	Vandalia silt loam, 15 to 35 percent slopes, very stony
W	Water
ZoB	Zoar silt loam, 3 to 8 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state, or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small (Named where applicable)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS

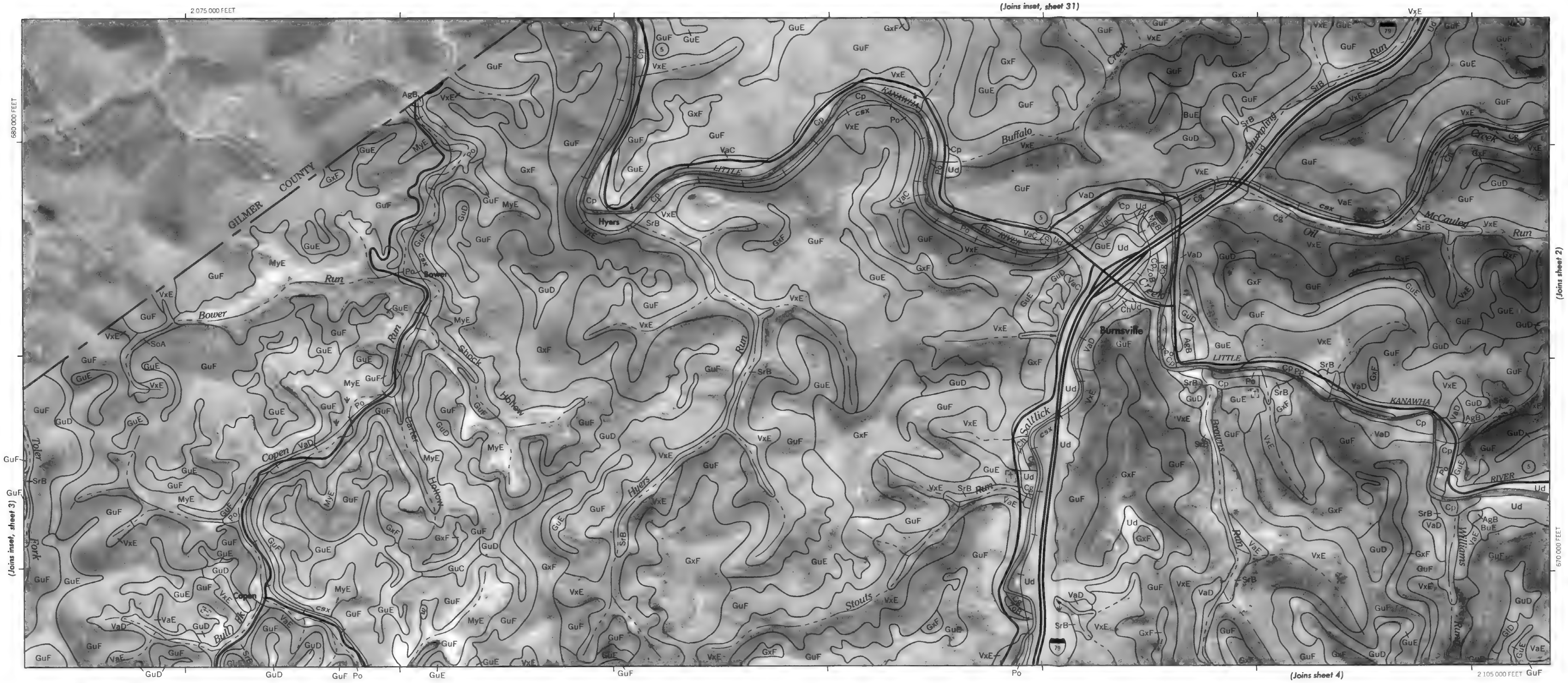
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

1

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

BRAXTON COUNTY, WEST VIRGINIA NO. 1



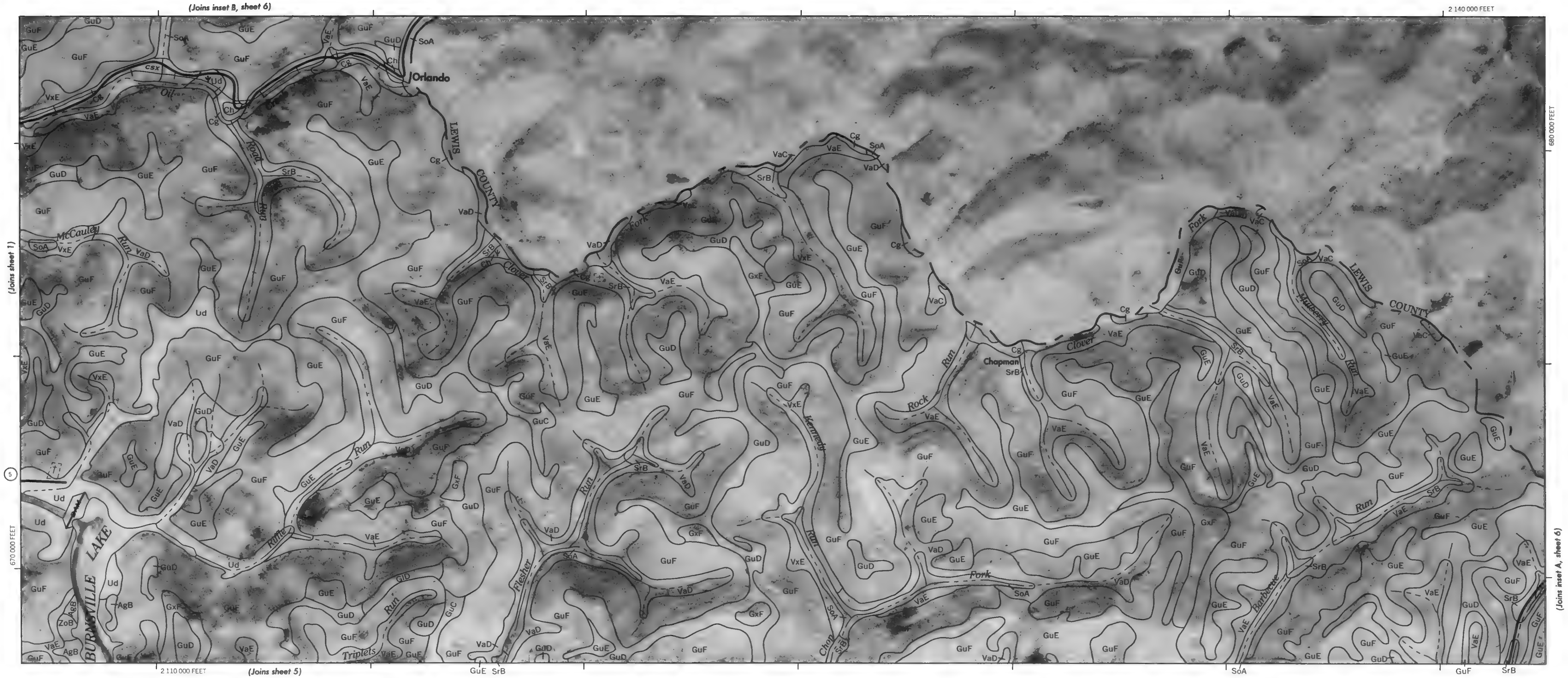
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 2

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 2

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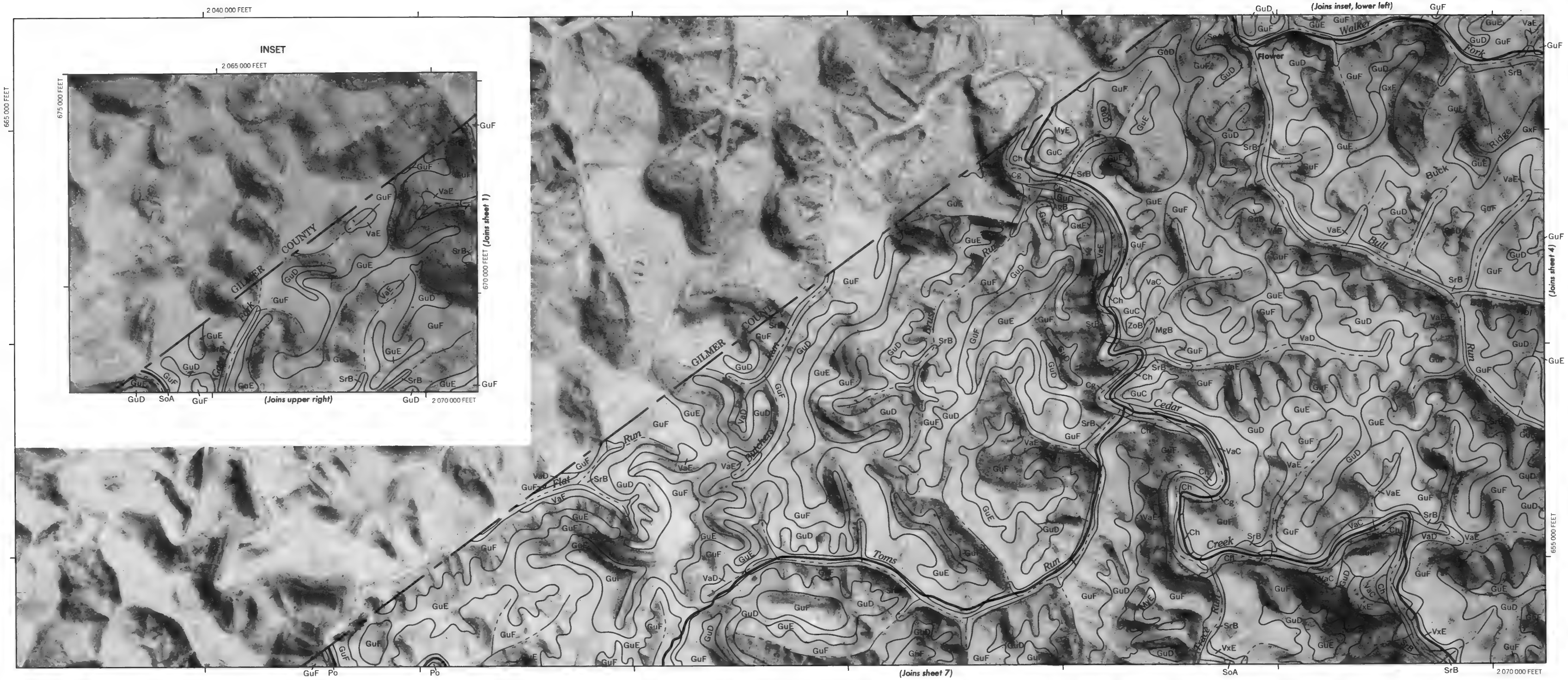
3

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA NO. 3



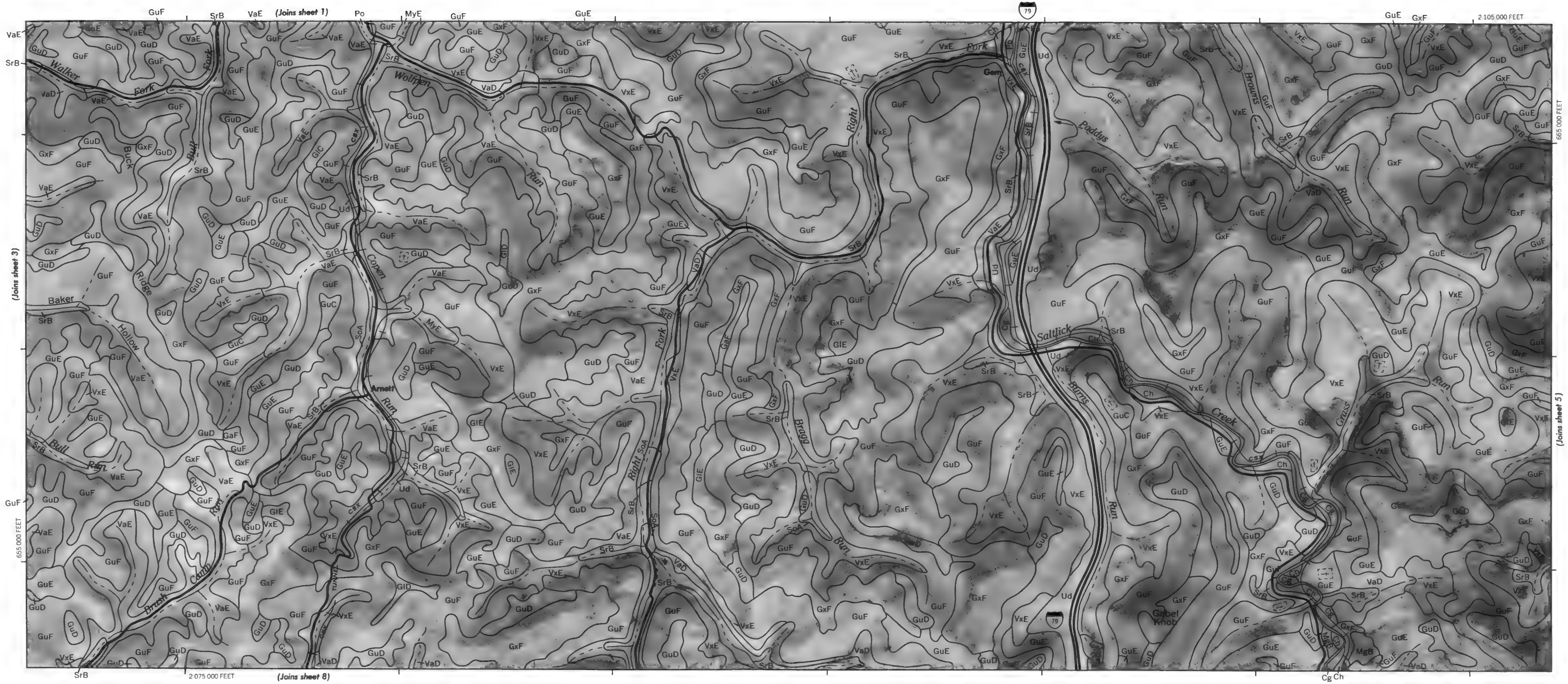
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

4

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 4

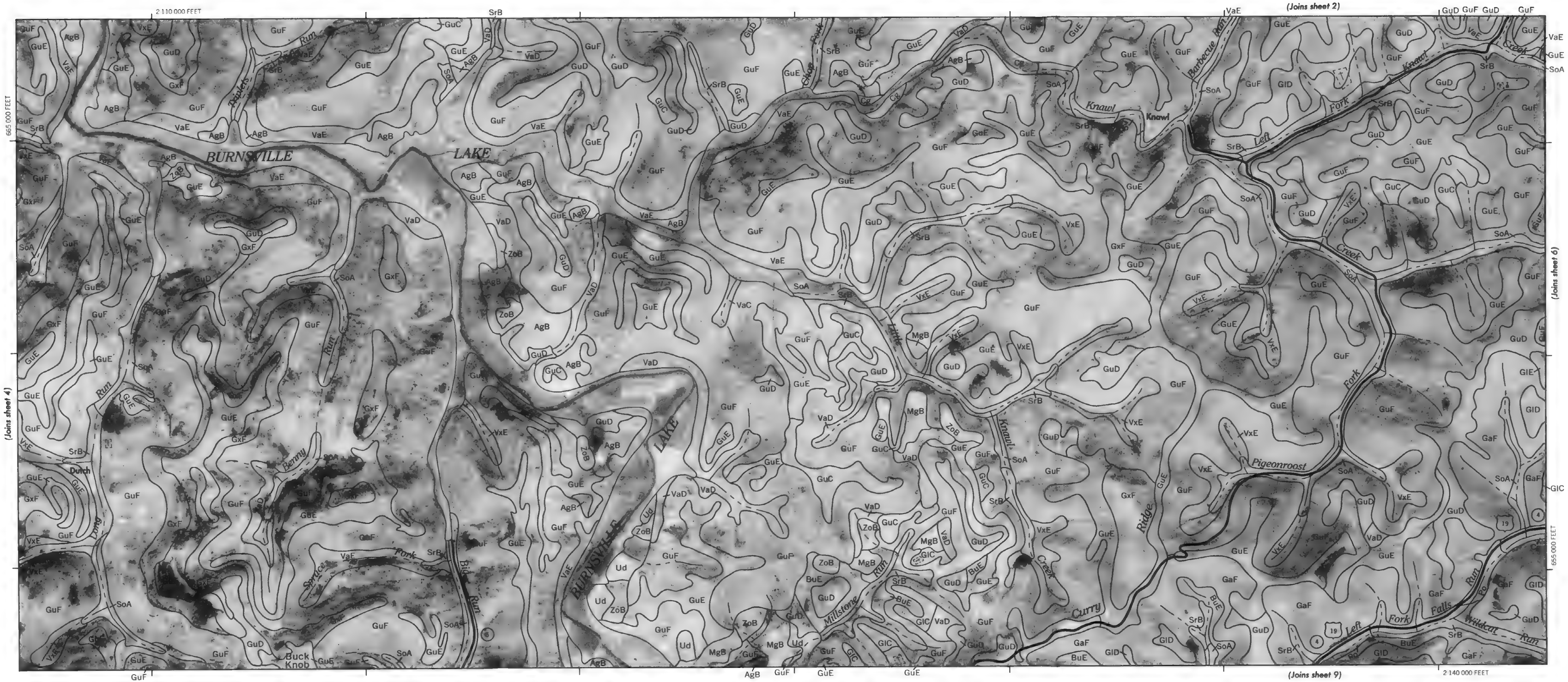
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA NO. 5



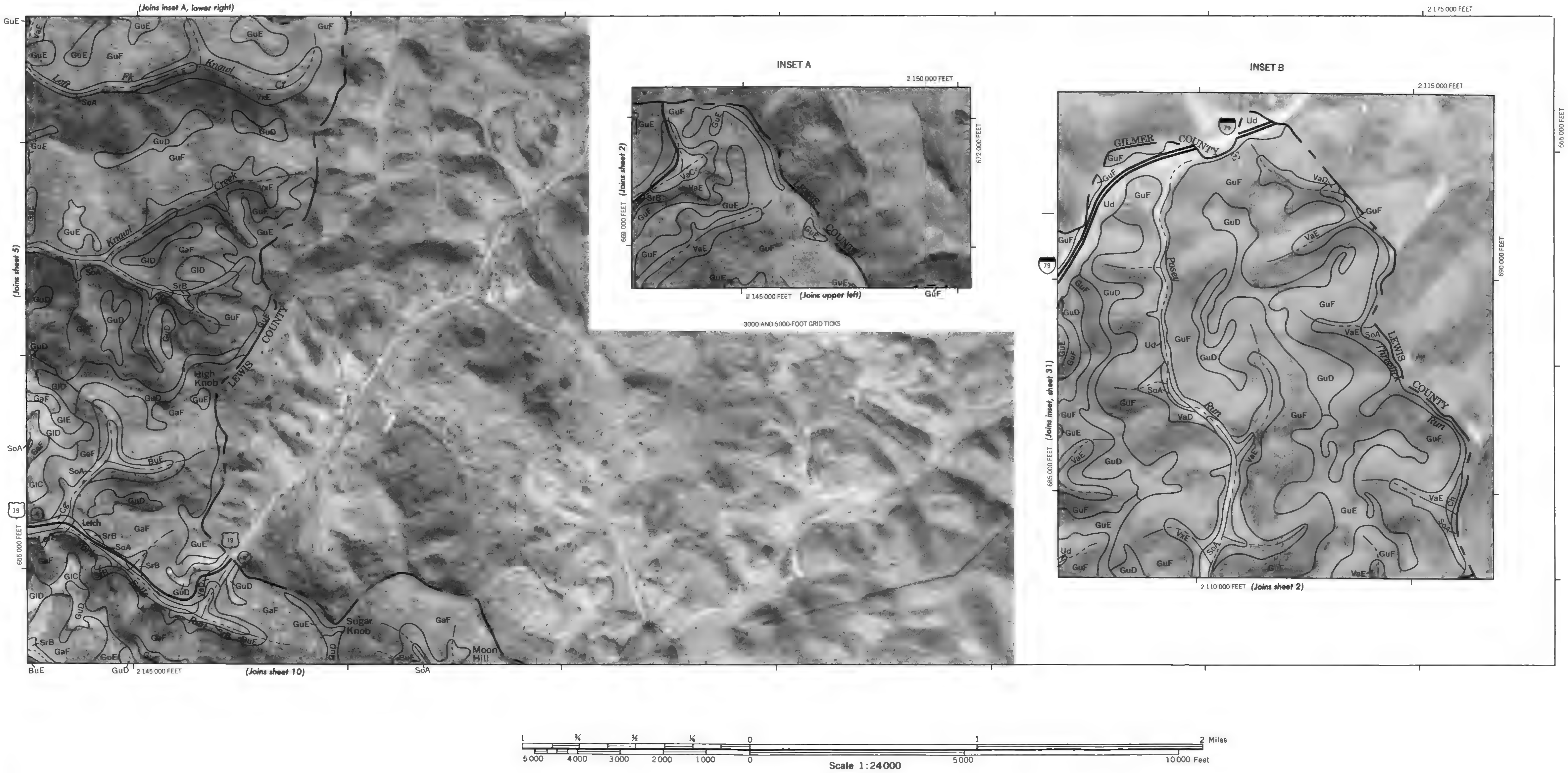
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

6

N



BRAXTON COUNTY, WEST VIRGINIA NO. 6

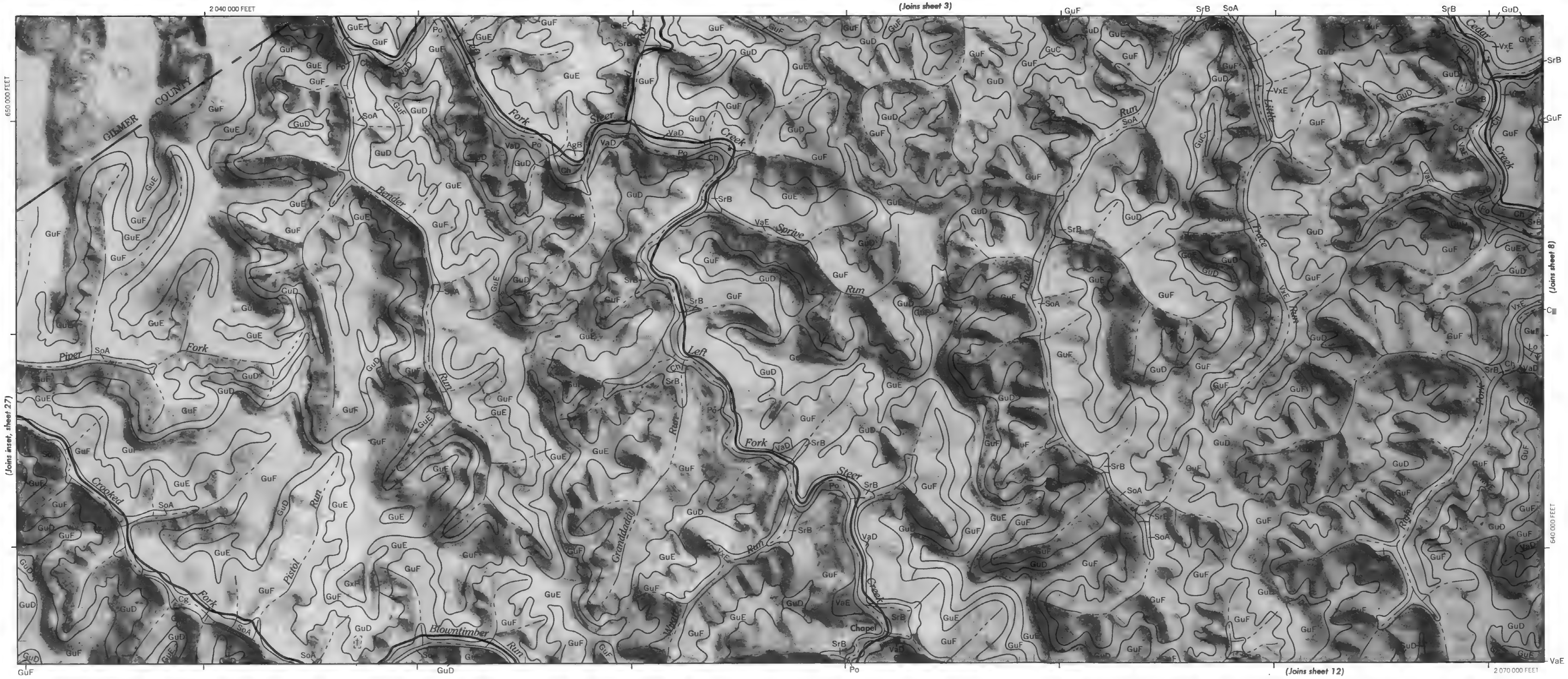
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

7

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA NO. 7



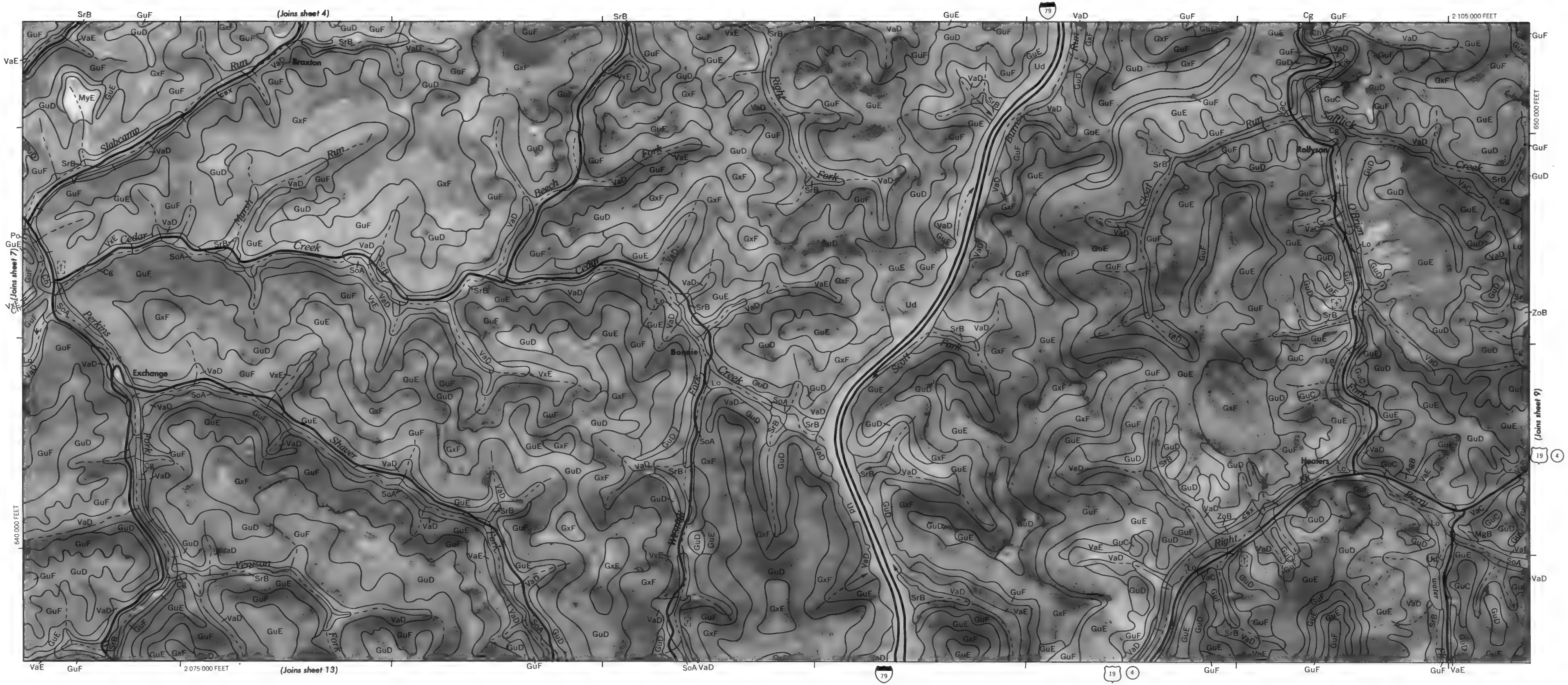
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 8

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

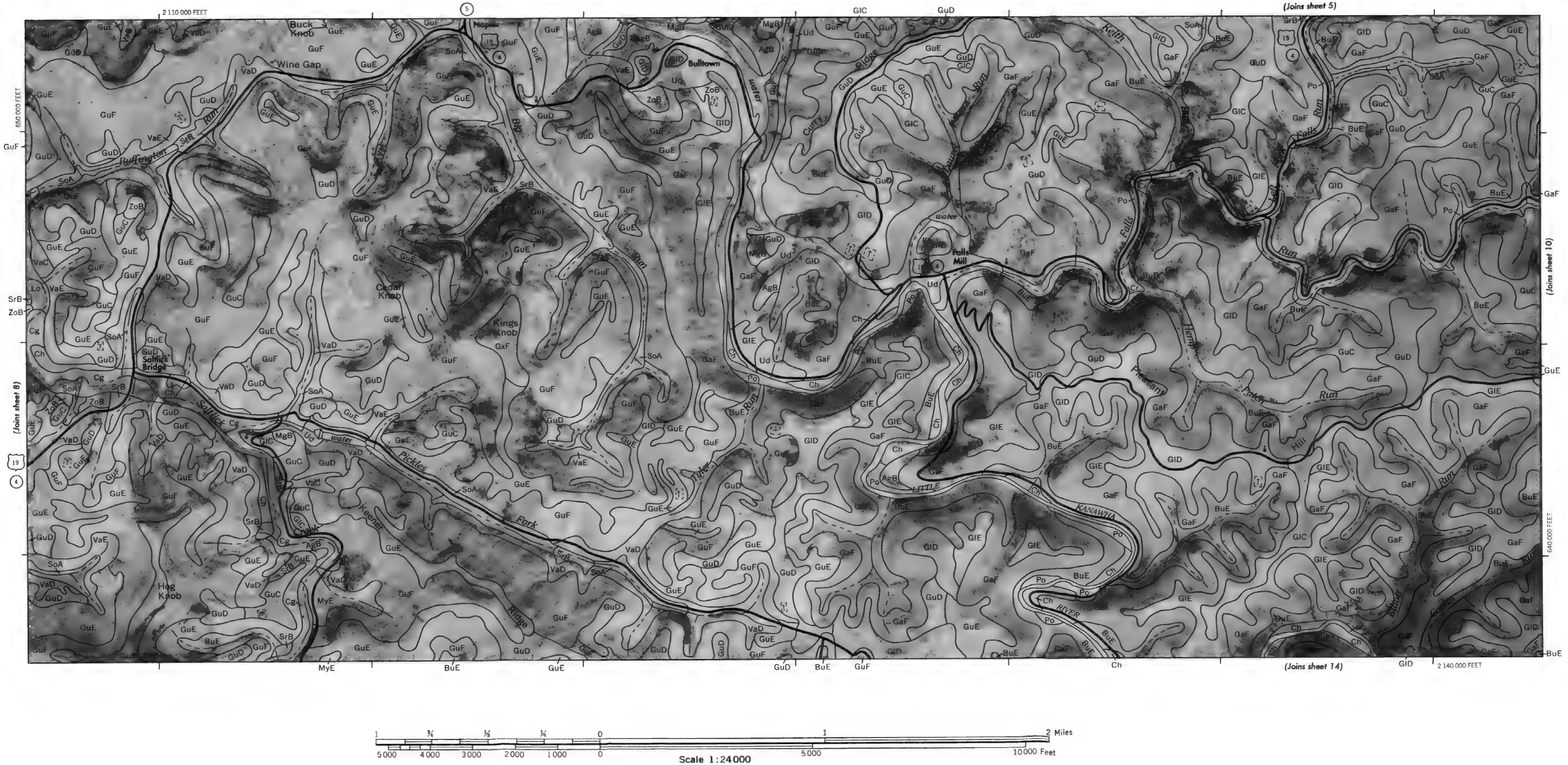
Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 8

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

9

N



Scale 1:24000

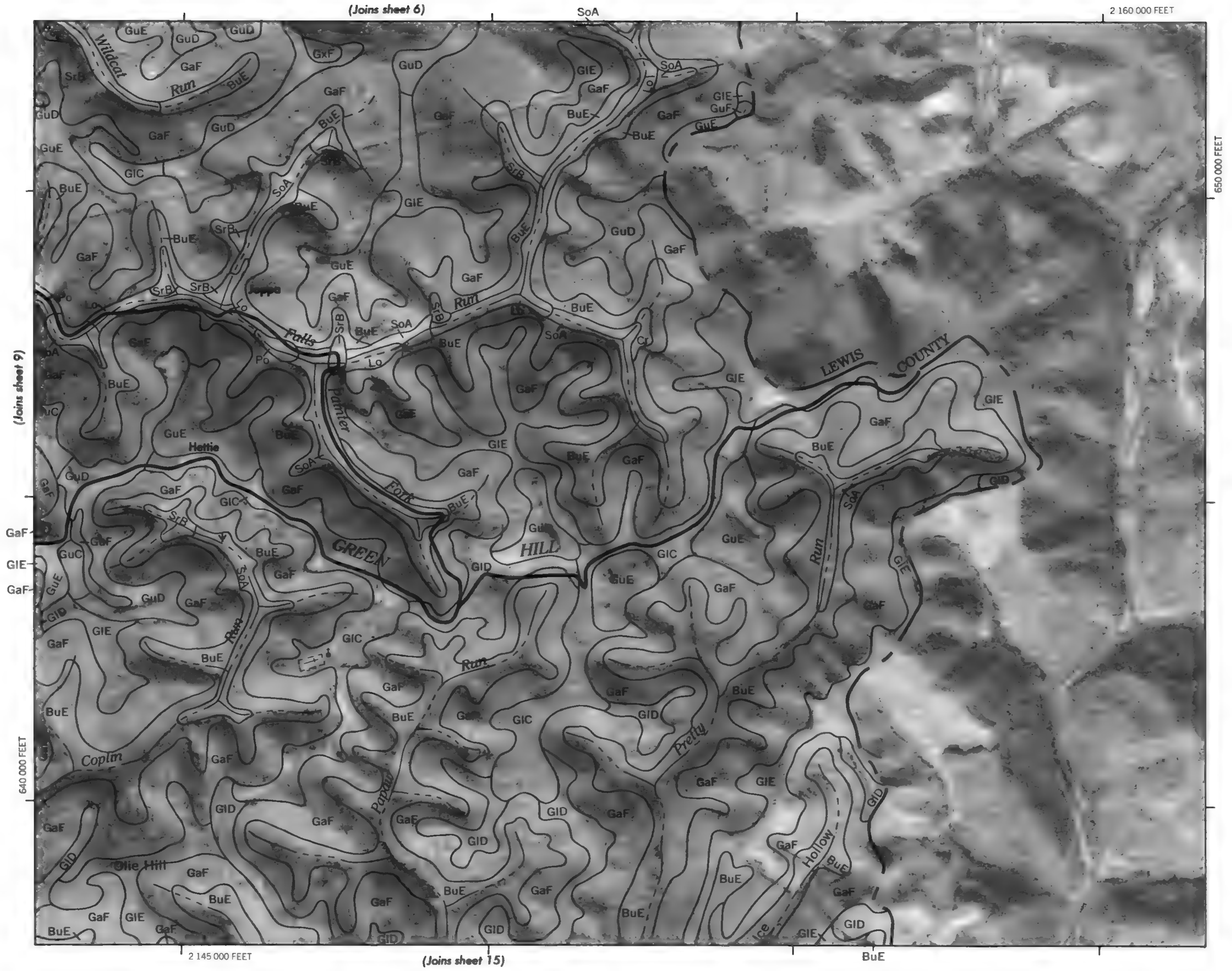
BRAXTON COUNTY, WEST VIRGINIA NO. 9

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

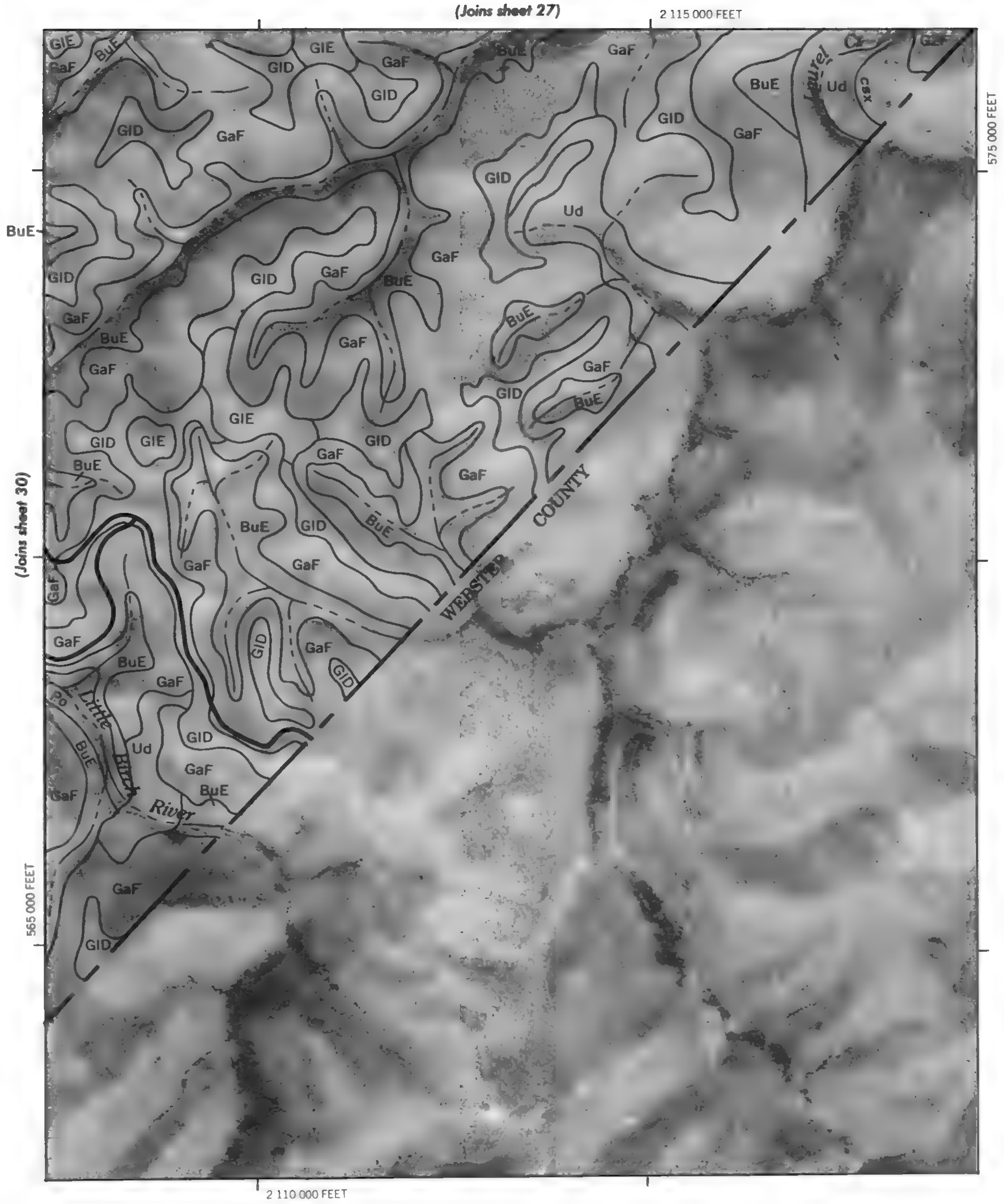
10

N

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 10



INSET



1 ¾ ½ ¼ 0 1 2

5000 4000 3000 2000 1000 0 5000 10000 Feet

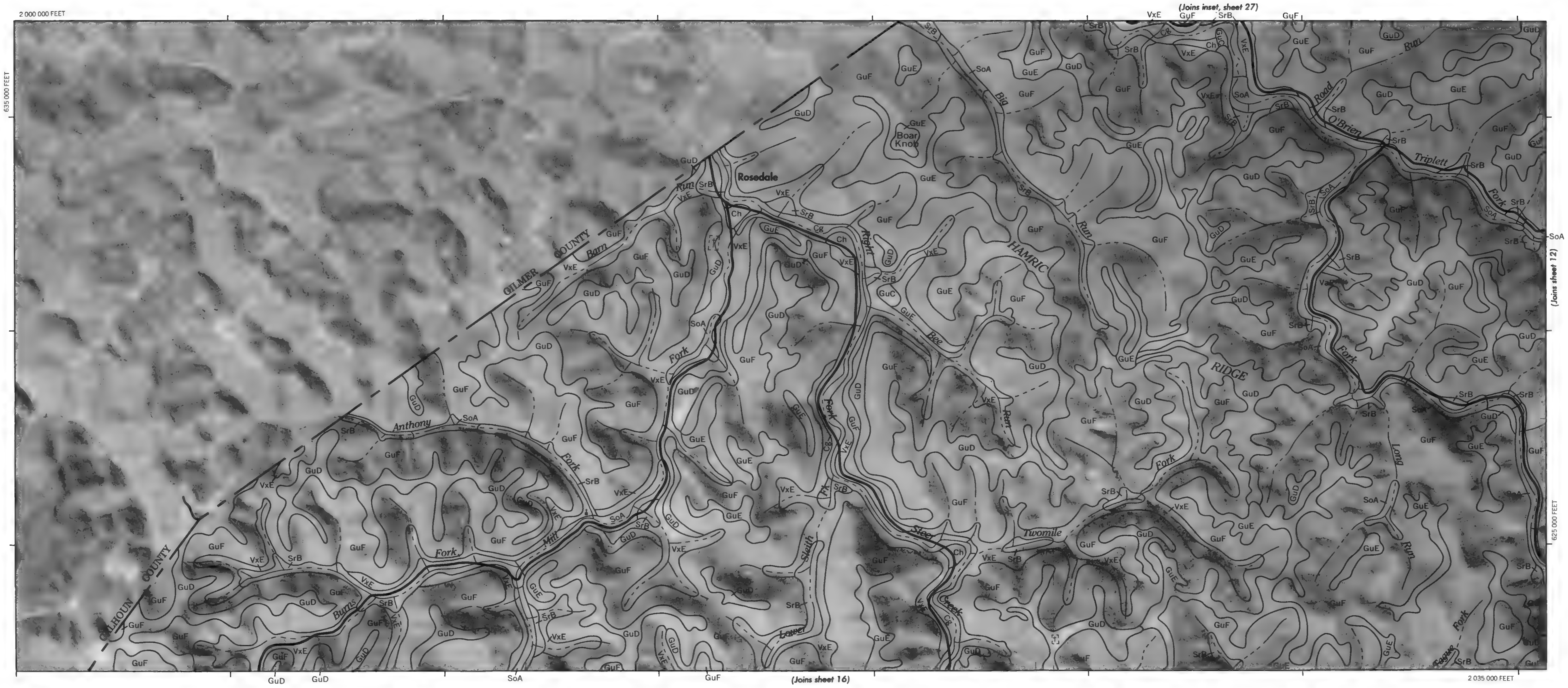
Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 10

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

11

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

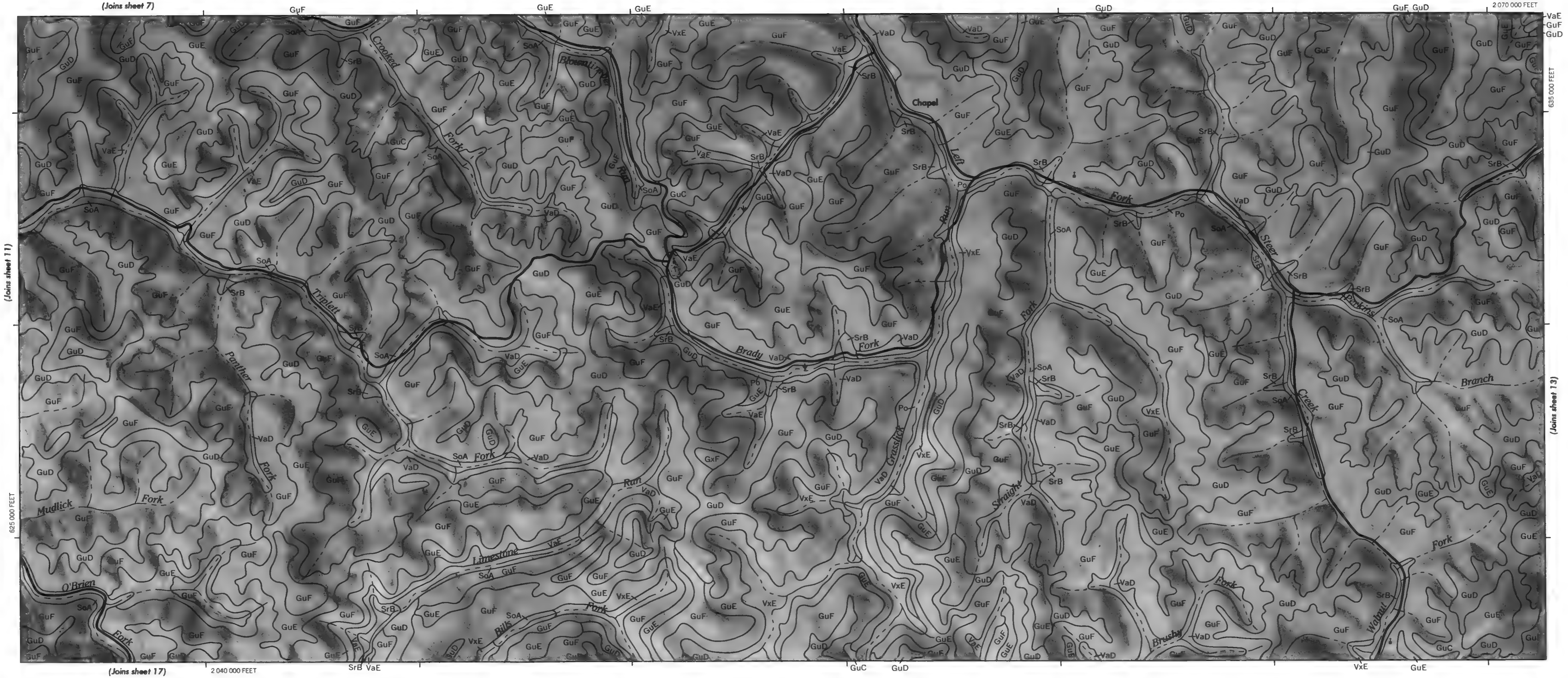
Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 11

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(12)

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

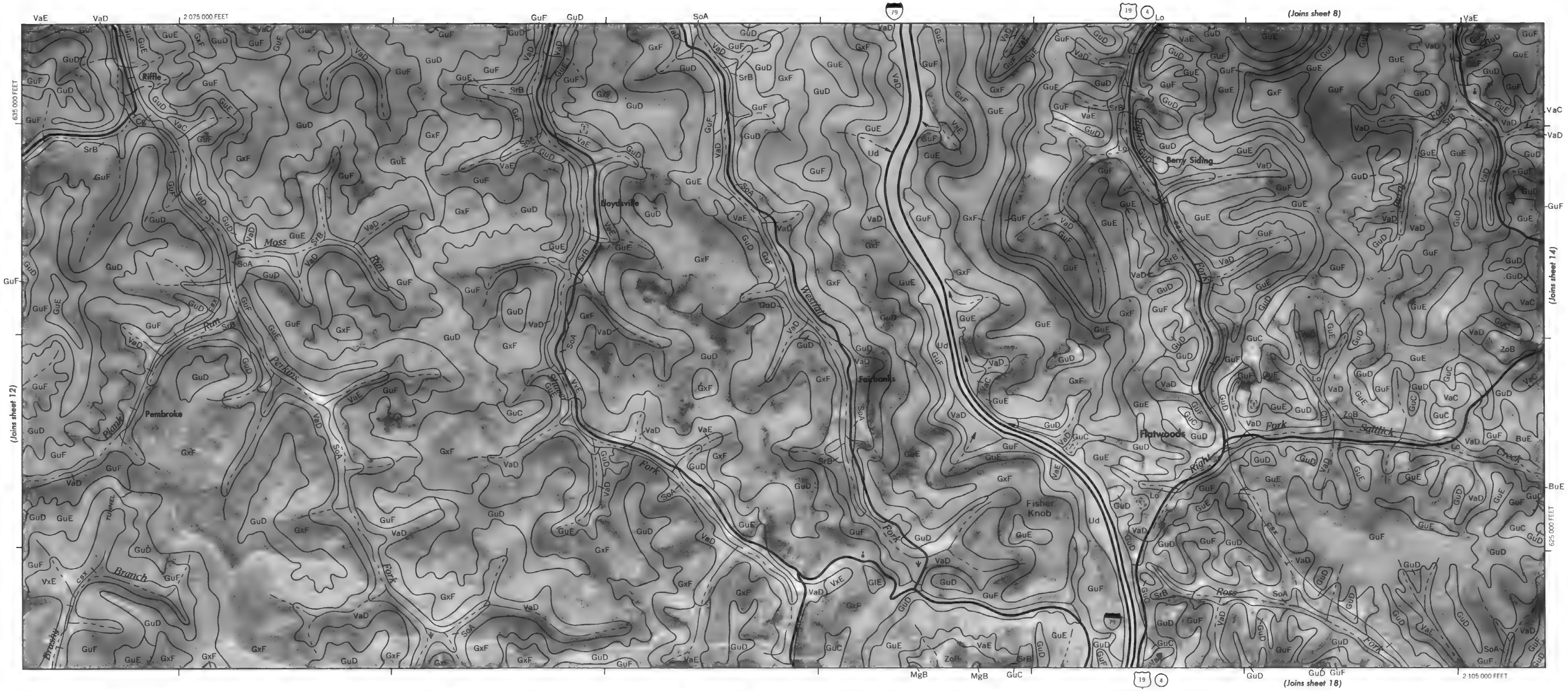
BRAXTON COUNTY, WEST VIRGINIA NO. 12

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

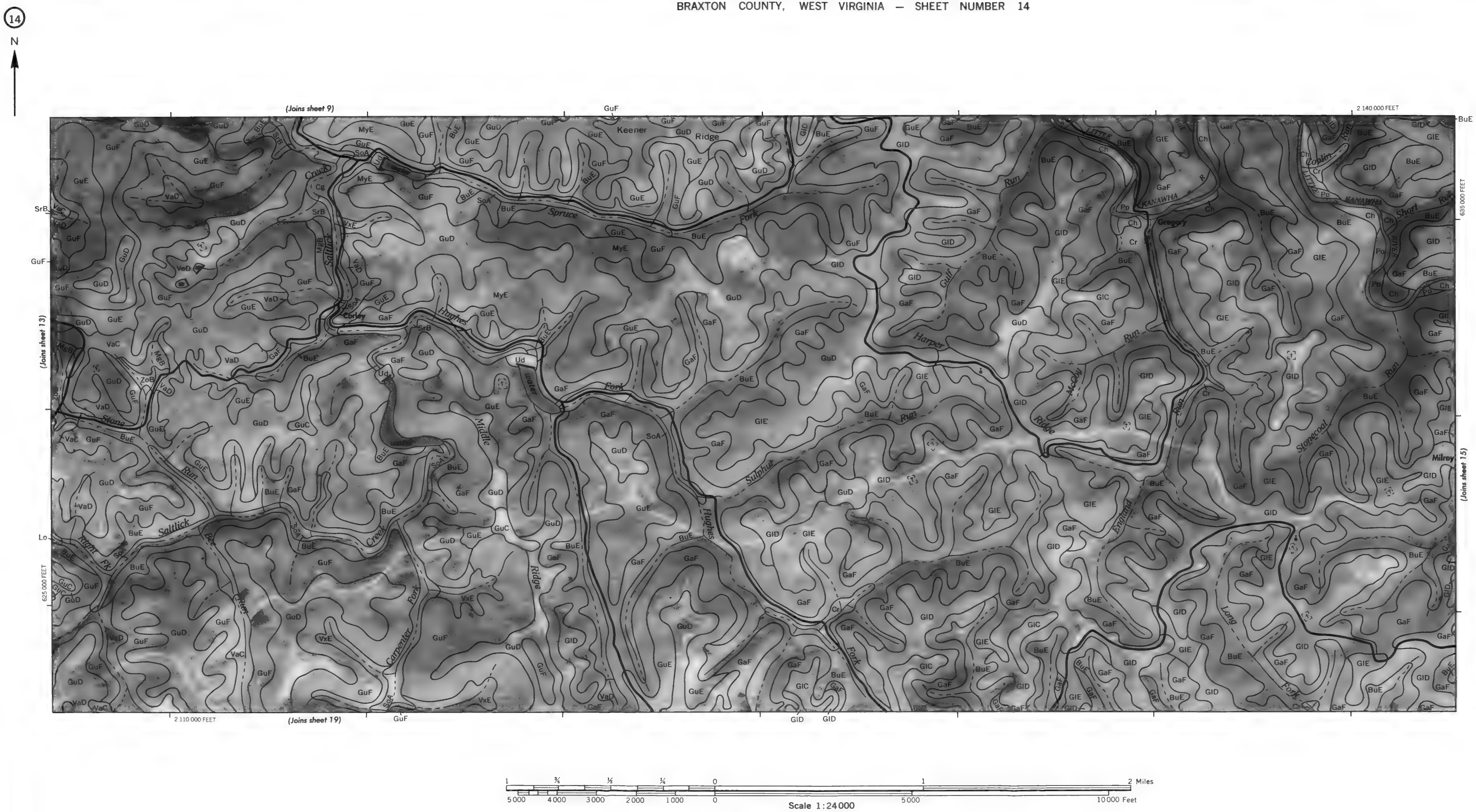
BRAXTON COUNTY, WEST VIRGINIA NO. 13



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000



BRAXTON COUNTY, WEST VIRGINIA NO. 14

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

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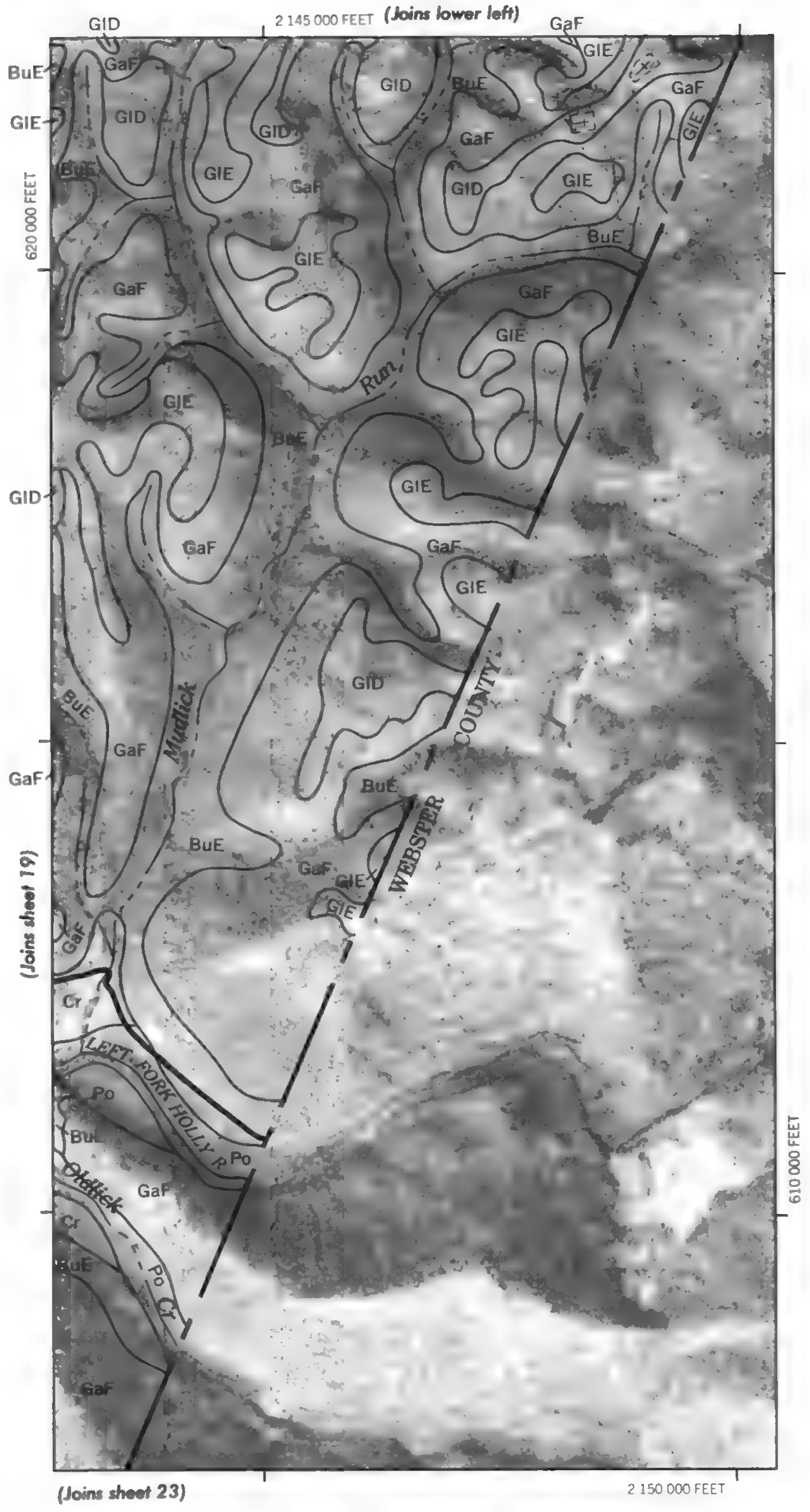
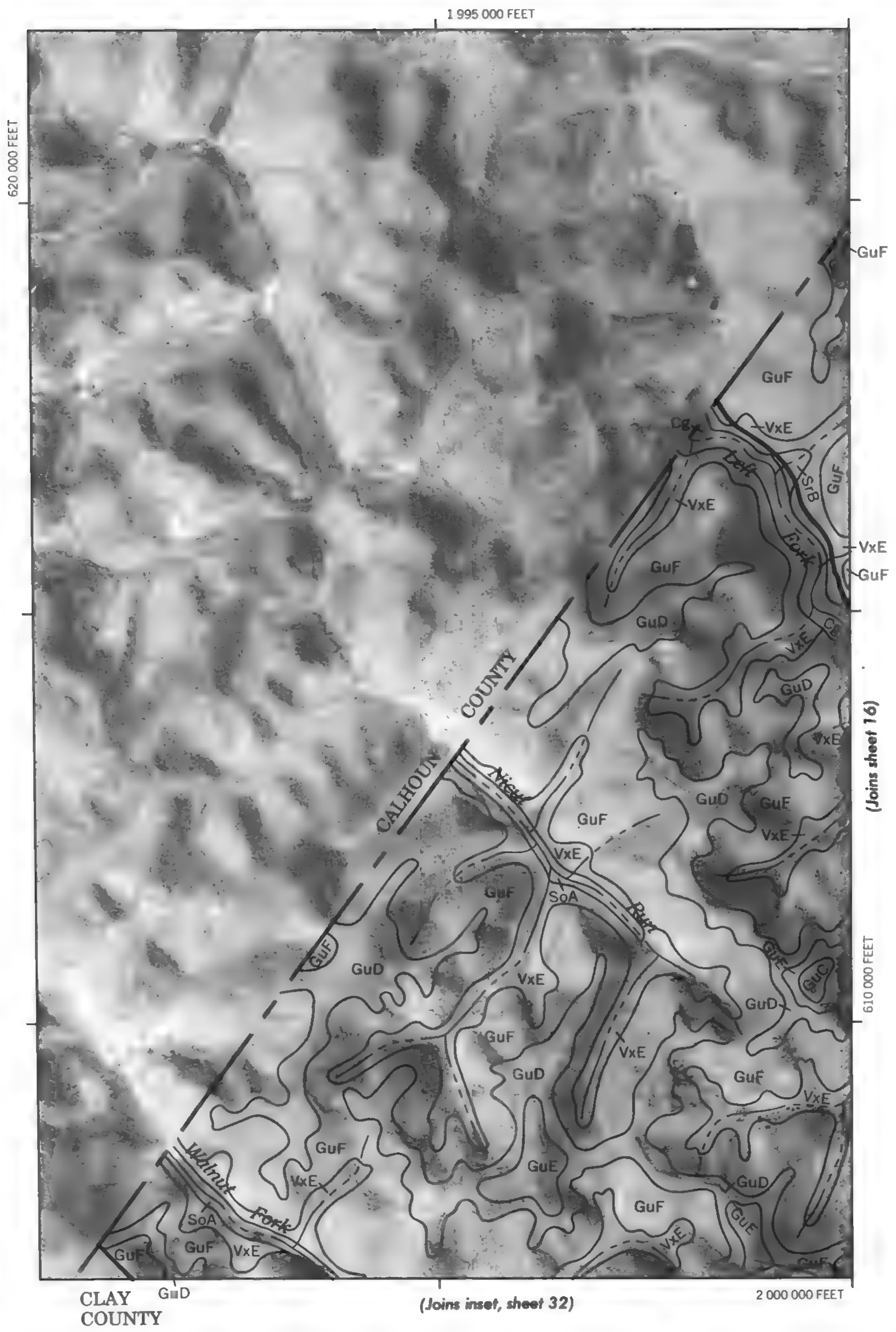
BRAXTON COUNTY, WEST VIRGINIA NO. 15

INSET A



INSET B



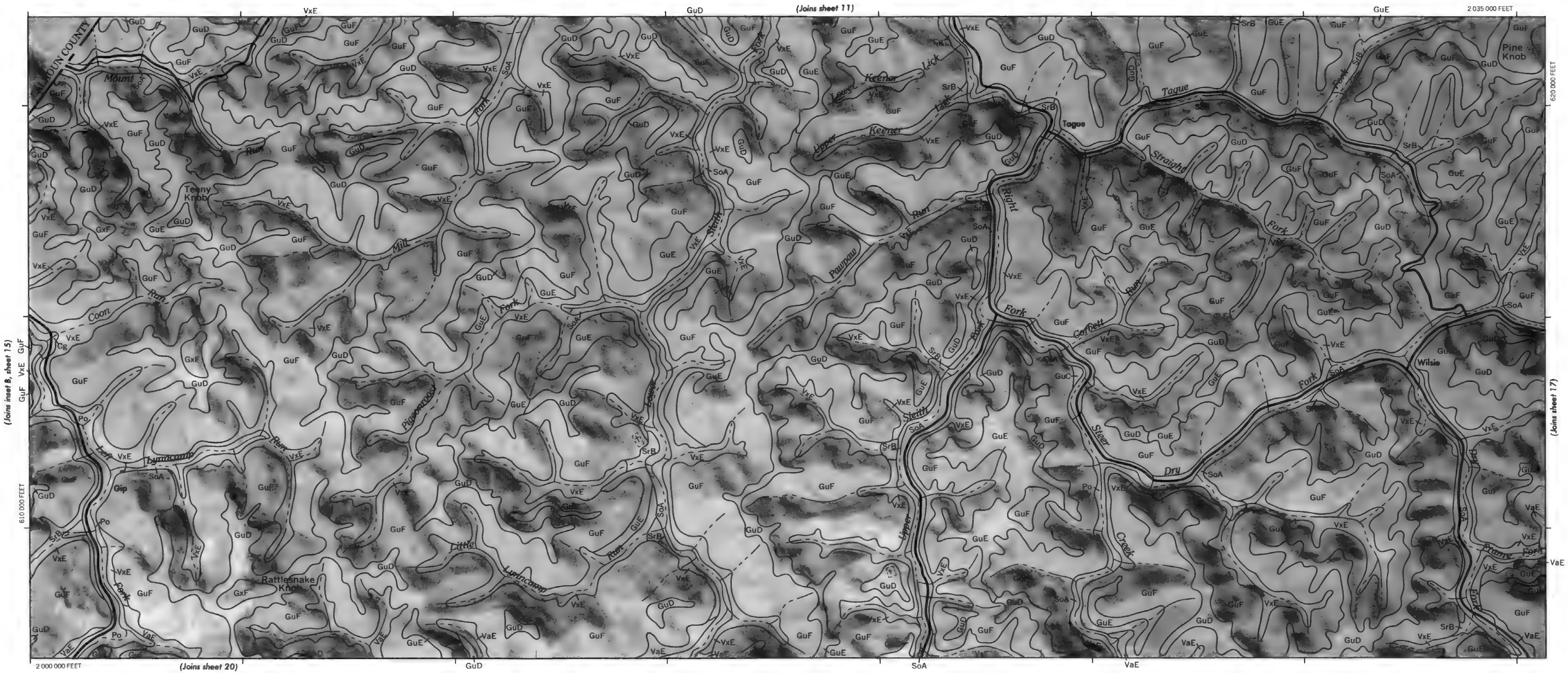
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 16

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 16

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

17

N

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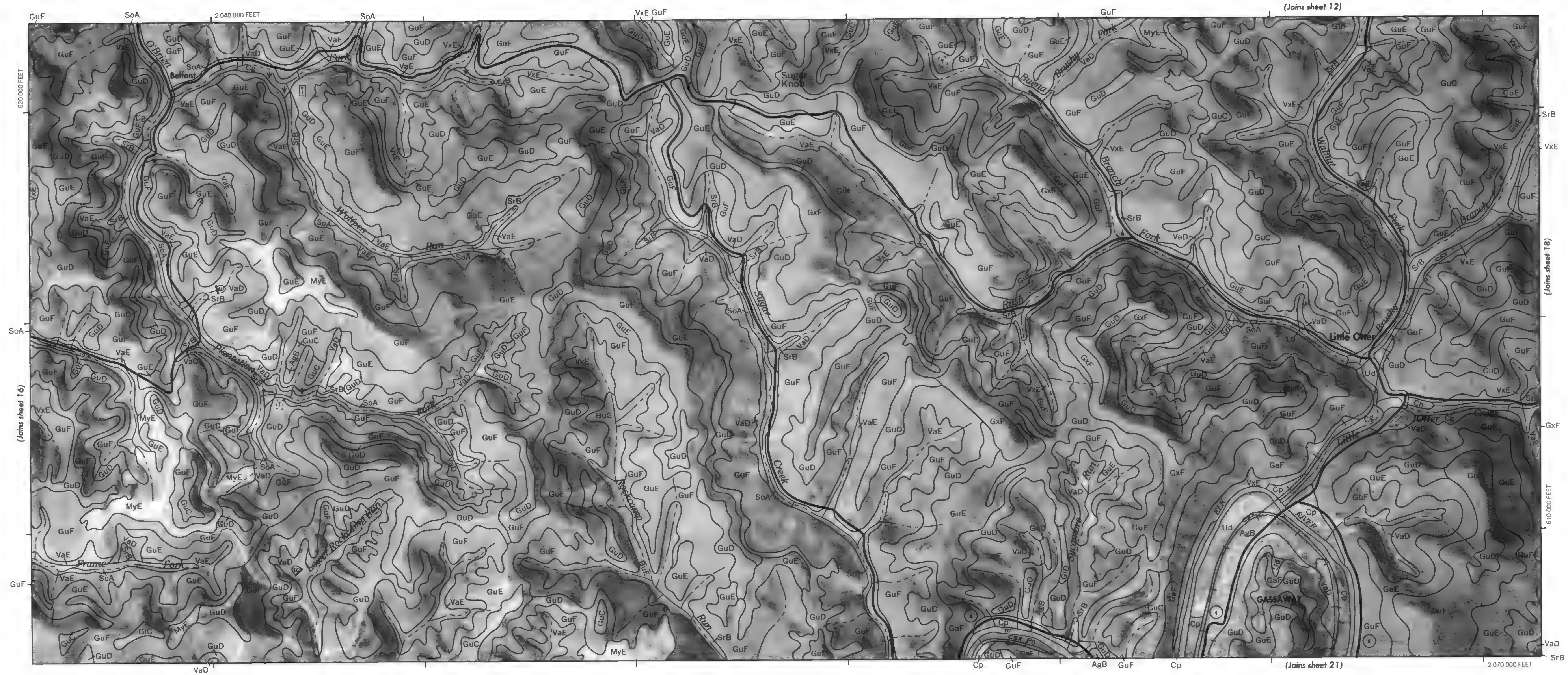
BRAXTON COUNTY, WEST VIRGINIA NO. 17



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 18

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

19

N

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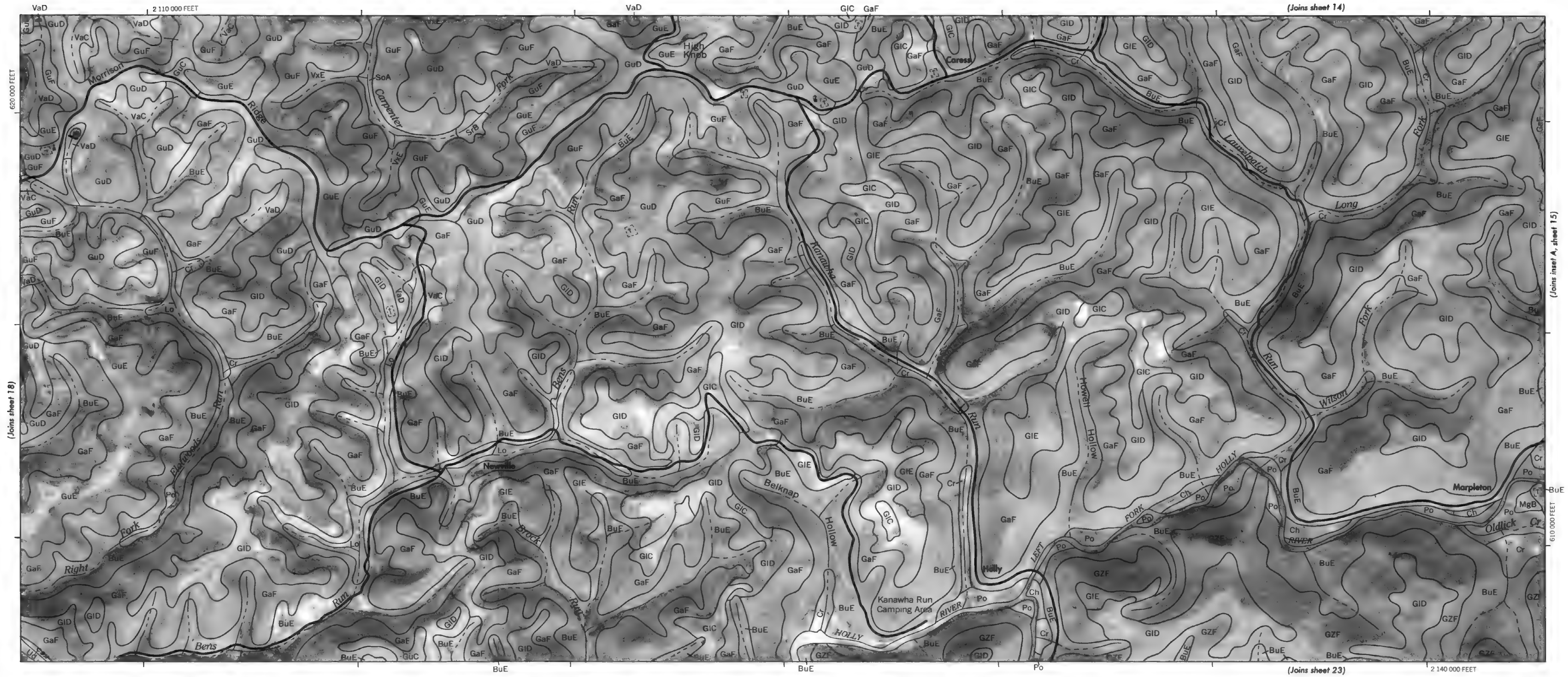
BRAXTON COUNTY, WEST VIRGINIA NO. 19



1 ¾ ½ ¼ 0 1 2 Miles

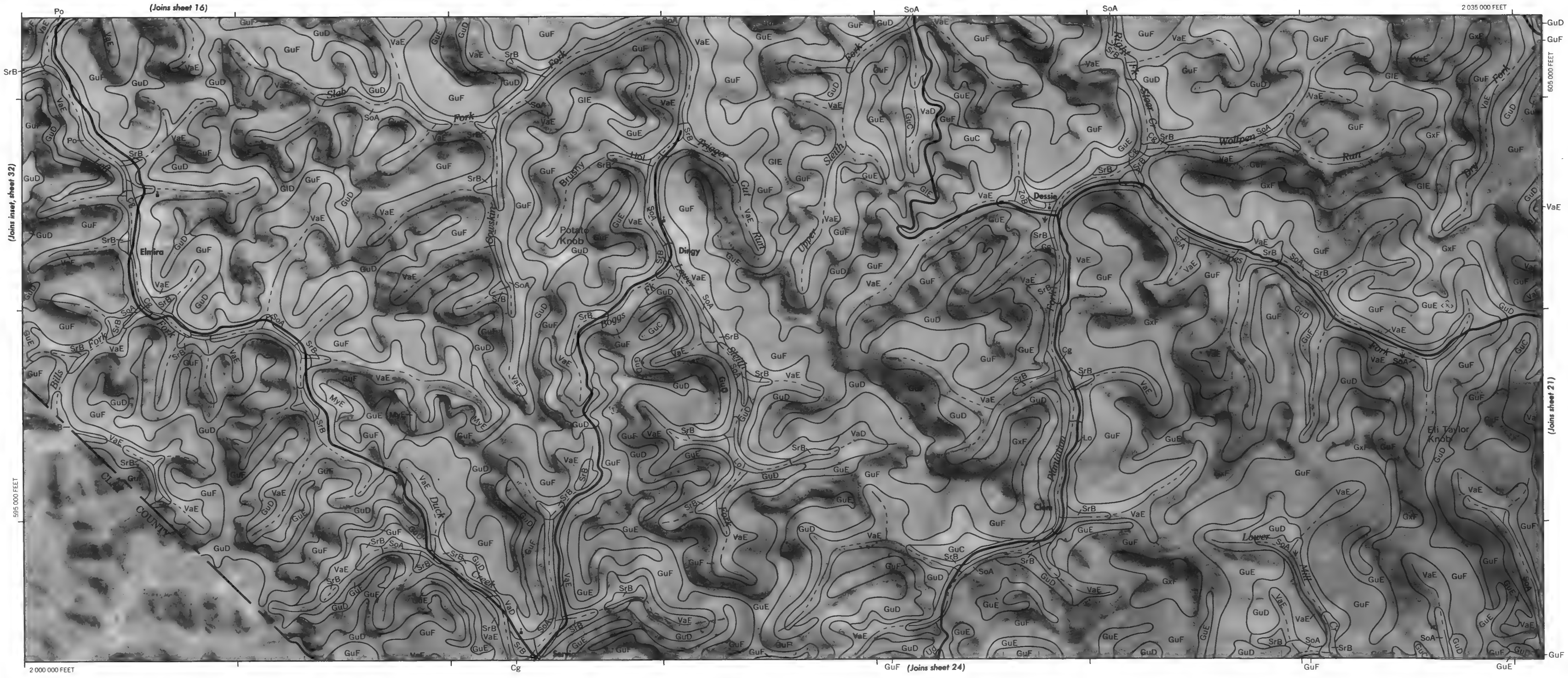
5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 20

20

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 20

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 21

21

N

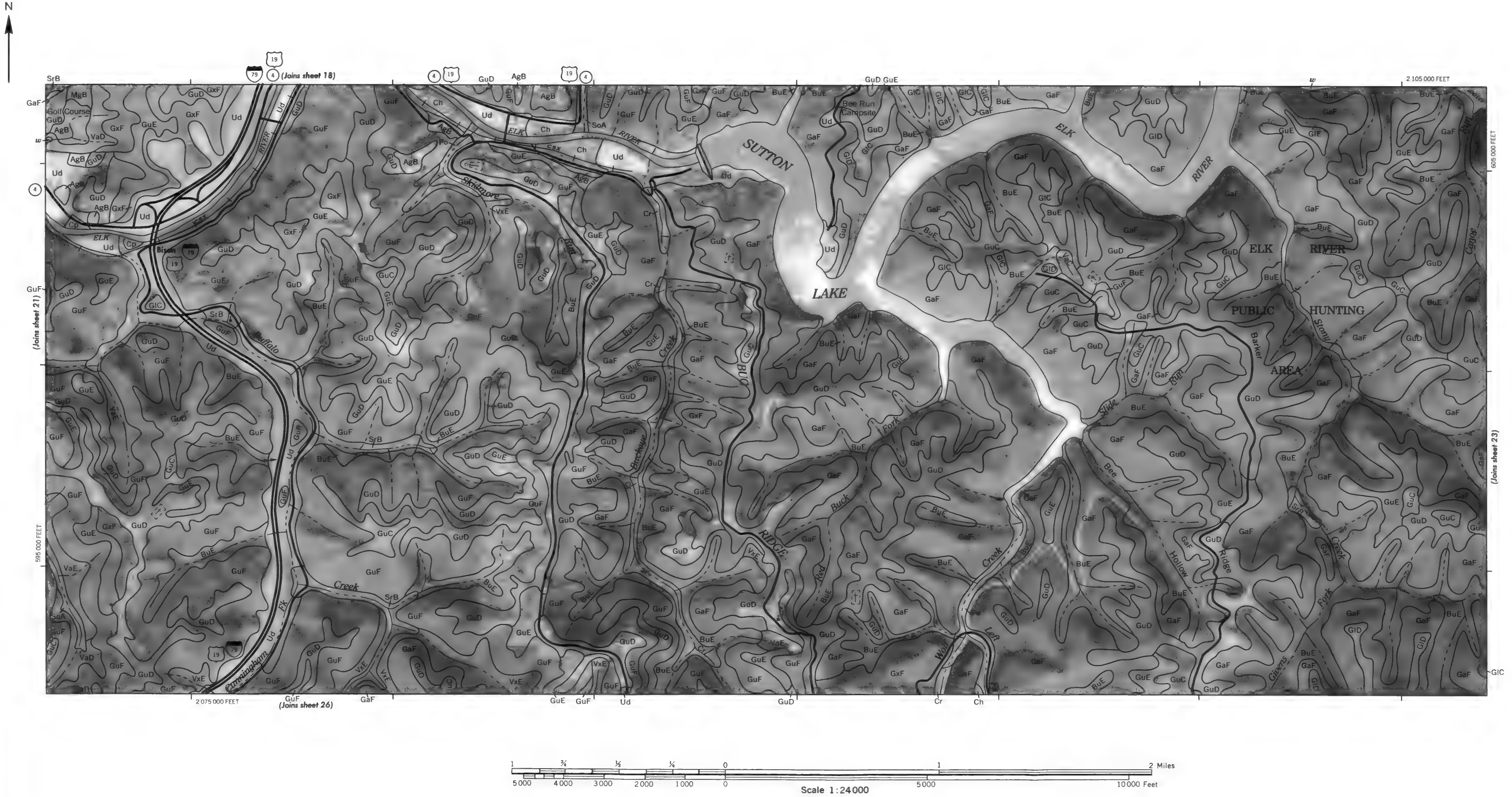
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA NO. 21

1 ¾ ½ ¼ 0 1 2 Miles

5 000 4 000 3 000 2 000 1 000 0 5 000 10 000 Feet

Scale 1:24 000

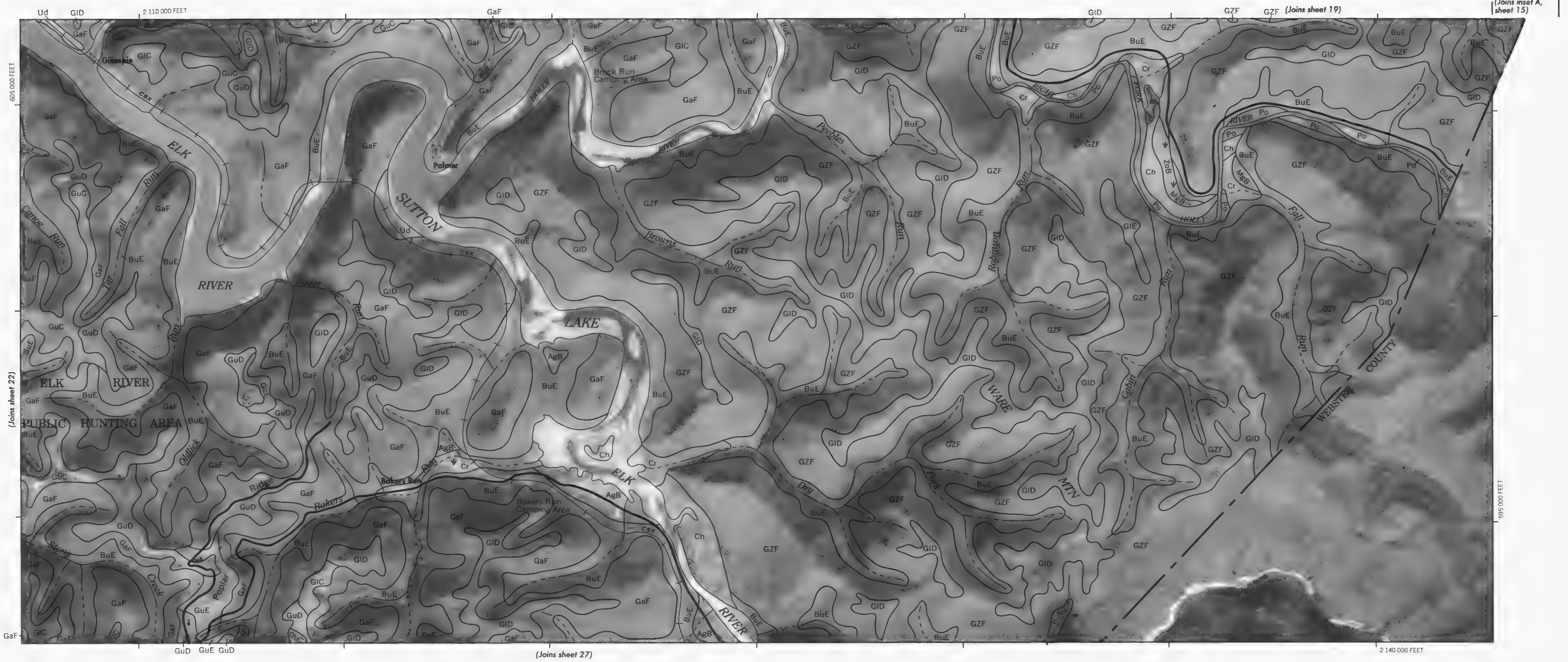


BRAXTON COUNTY, WEST VIRGINIA NO. 22

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

BRAXTON COUNTY, WEST VIRGINIA NO. 23



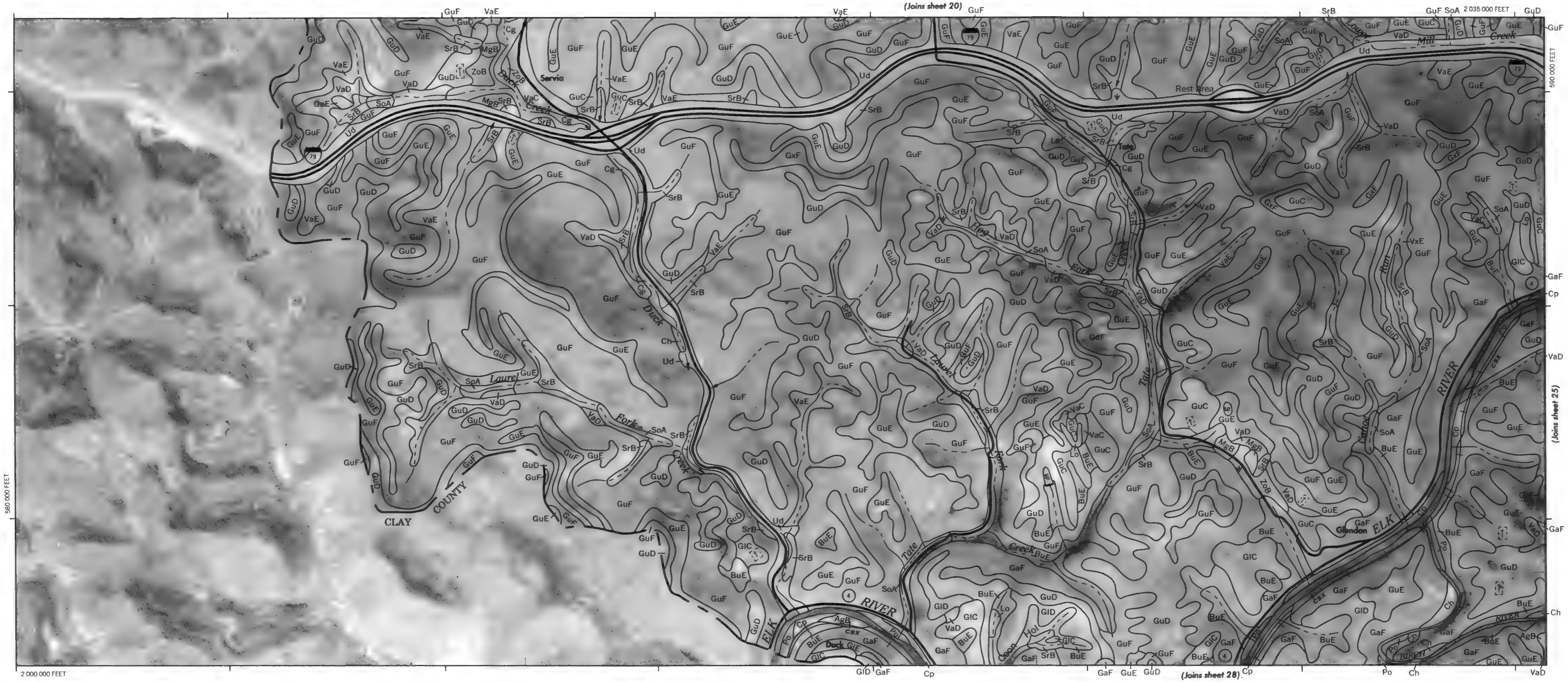
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

24

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10 000 Feet

Scale 1:24 000

BRAXTON COUNTY, WEST VIRGINIA NO. 24

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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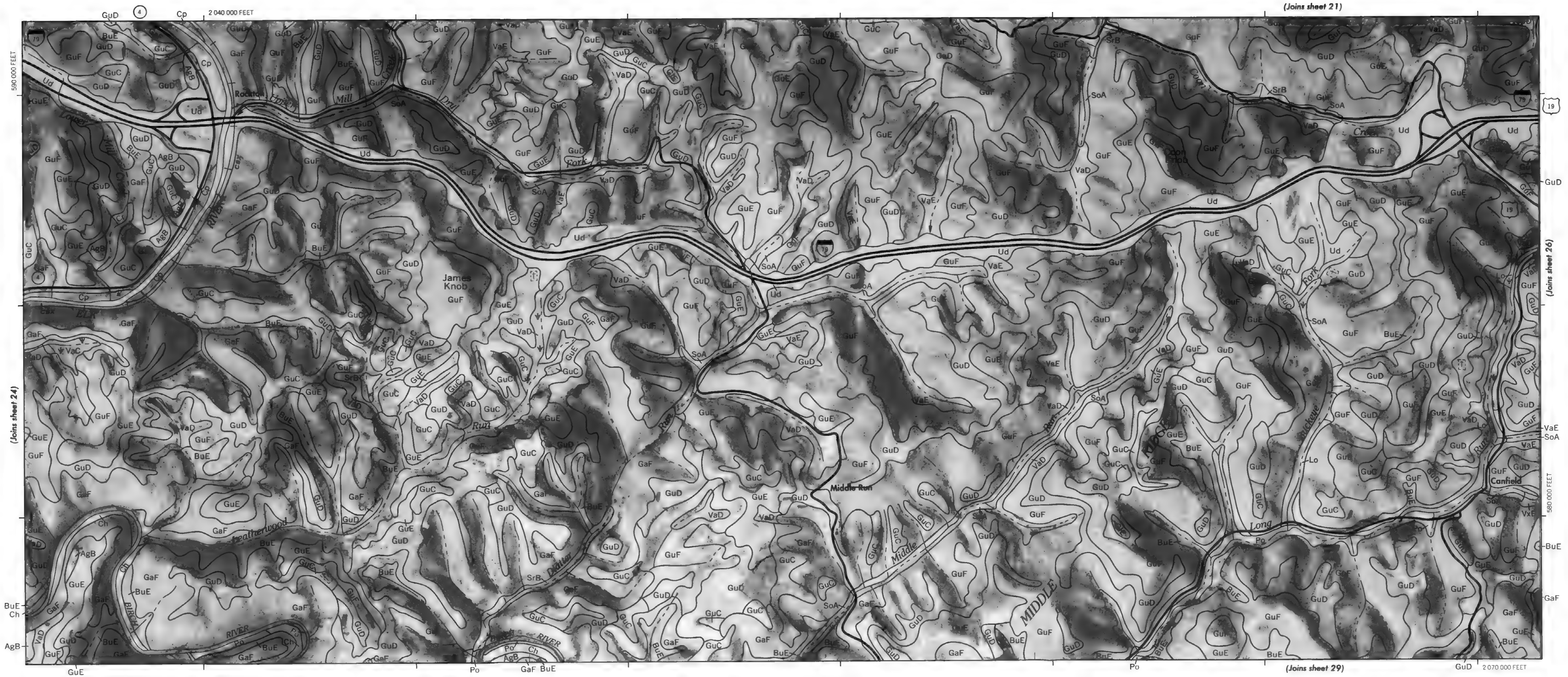
BRAXTON COUNTY, WEST VIRGINIA NO. 25



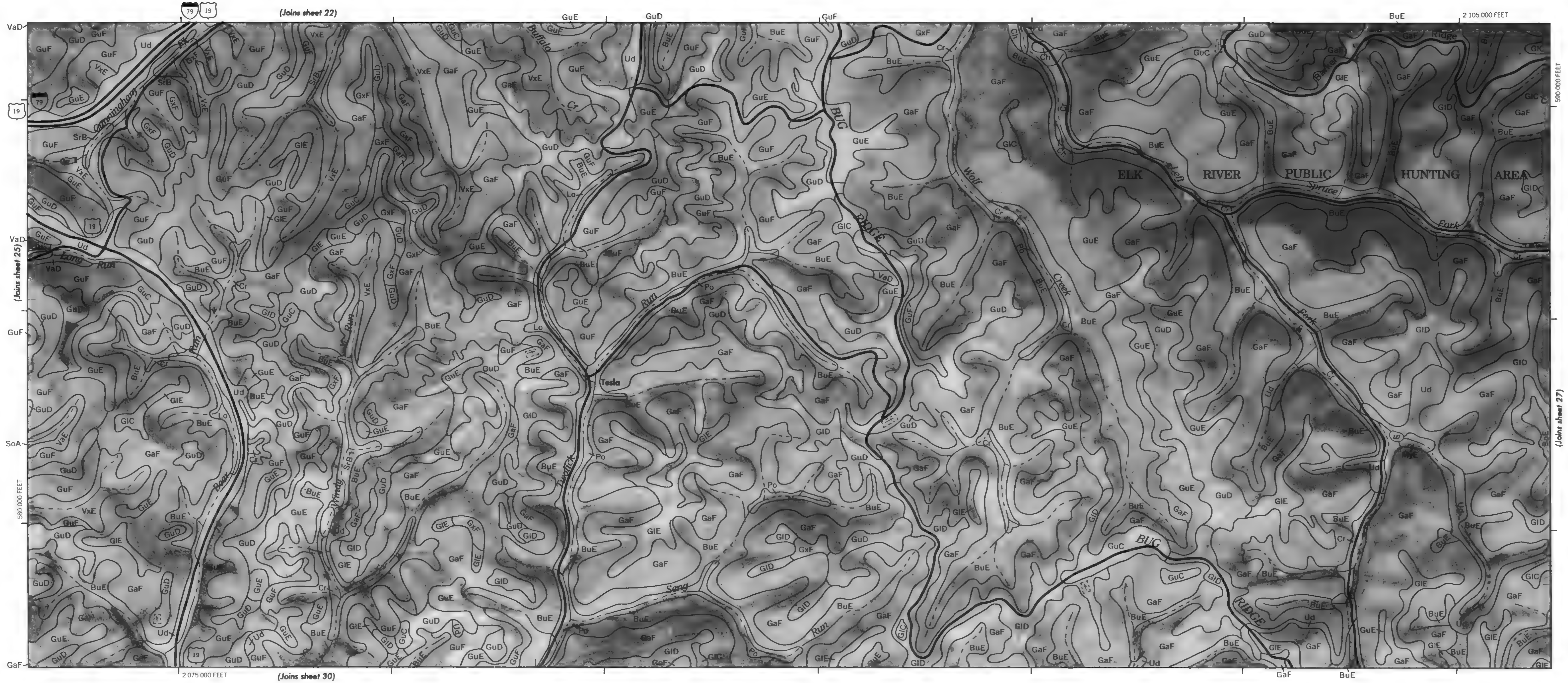
1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 26

N



1 ¾ ½ ¼ 0 1

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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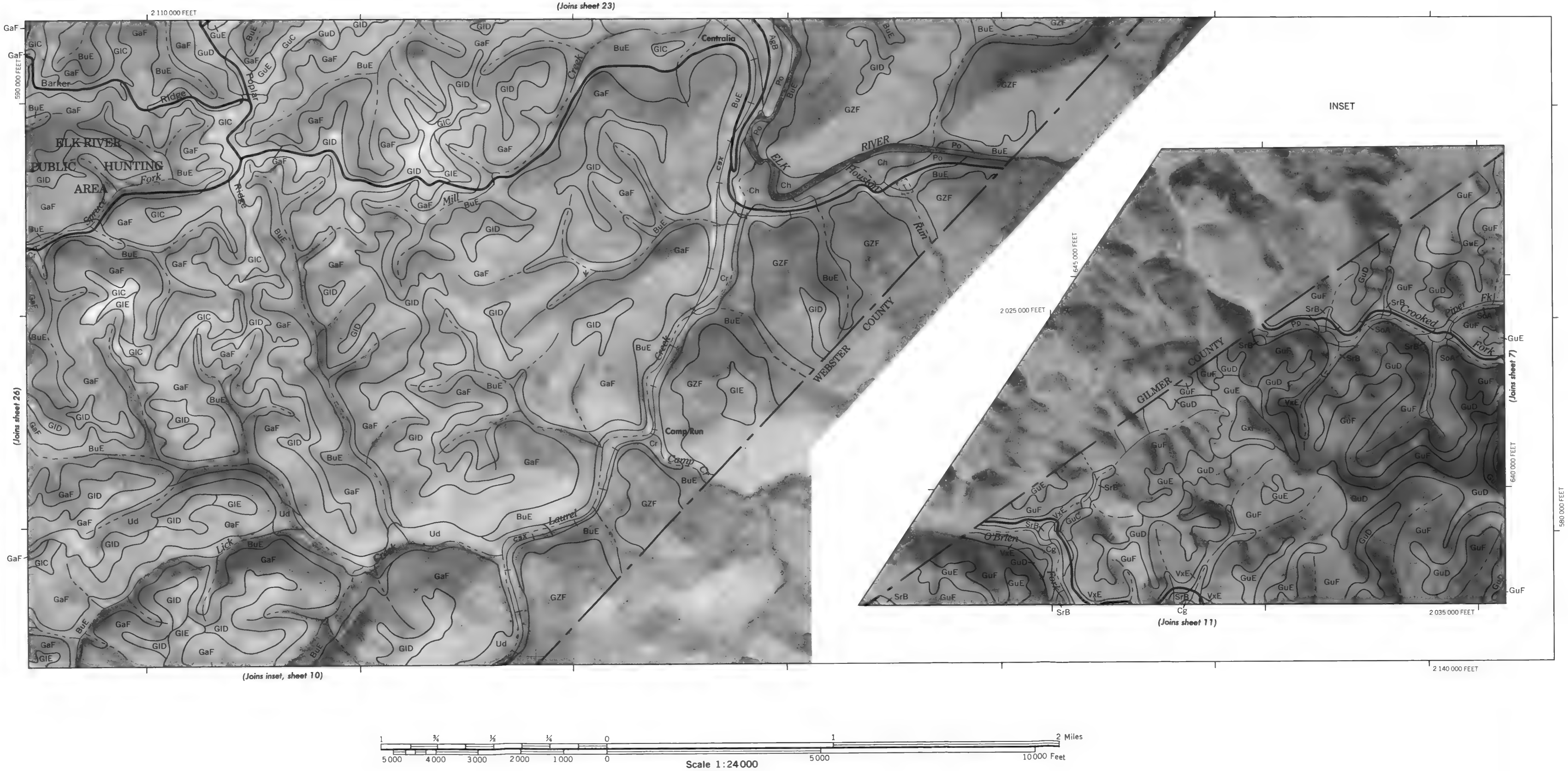
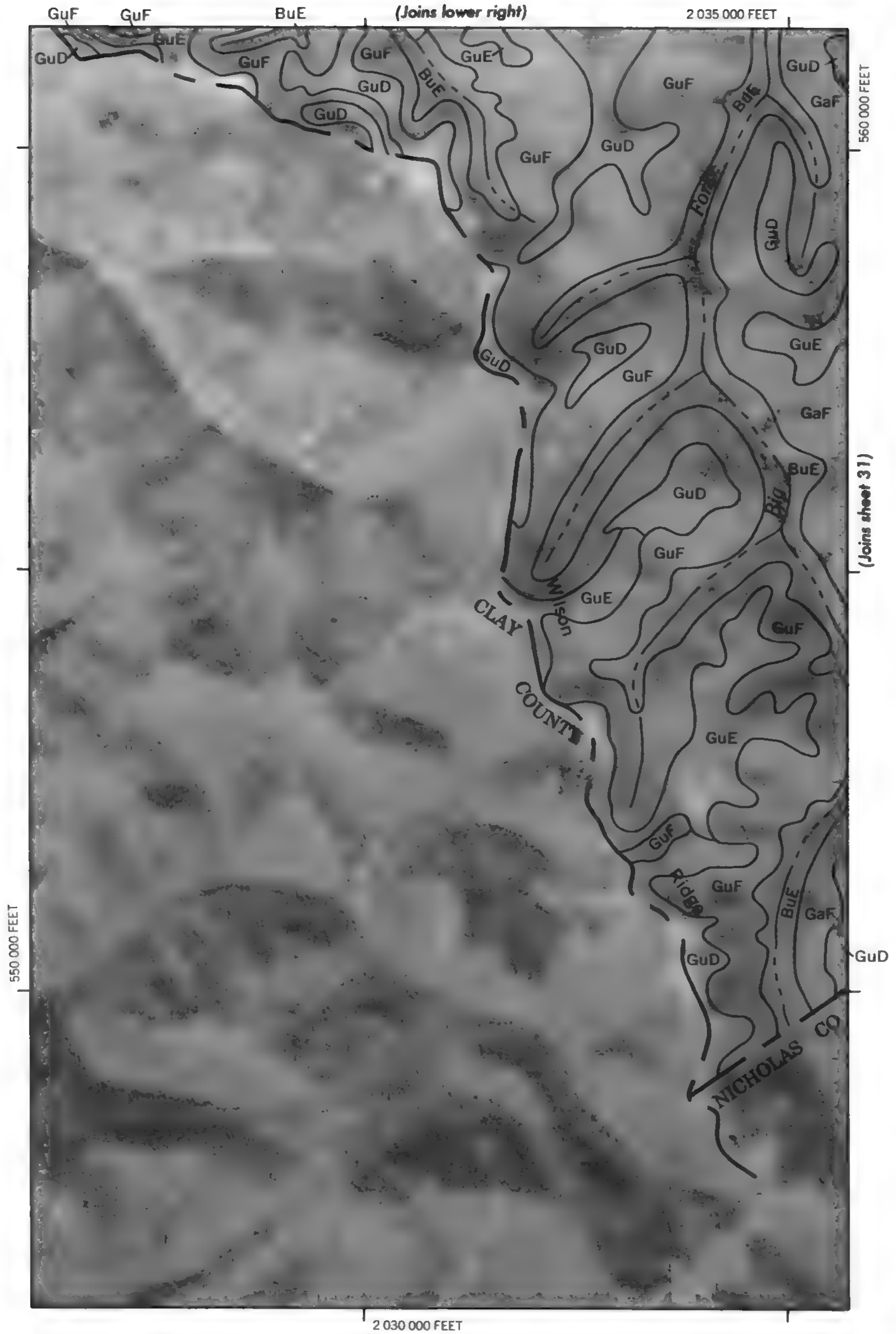
BRAXTON COUNTY, WEST VIRGINIA NO. 27

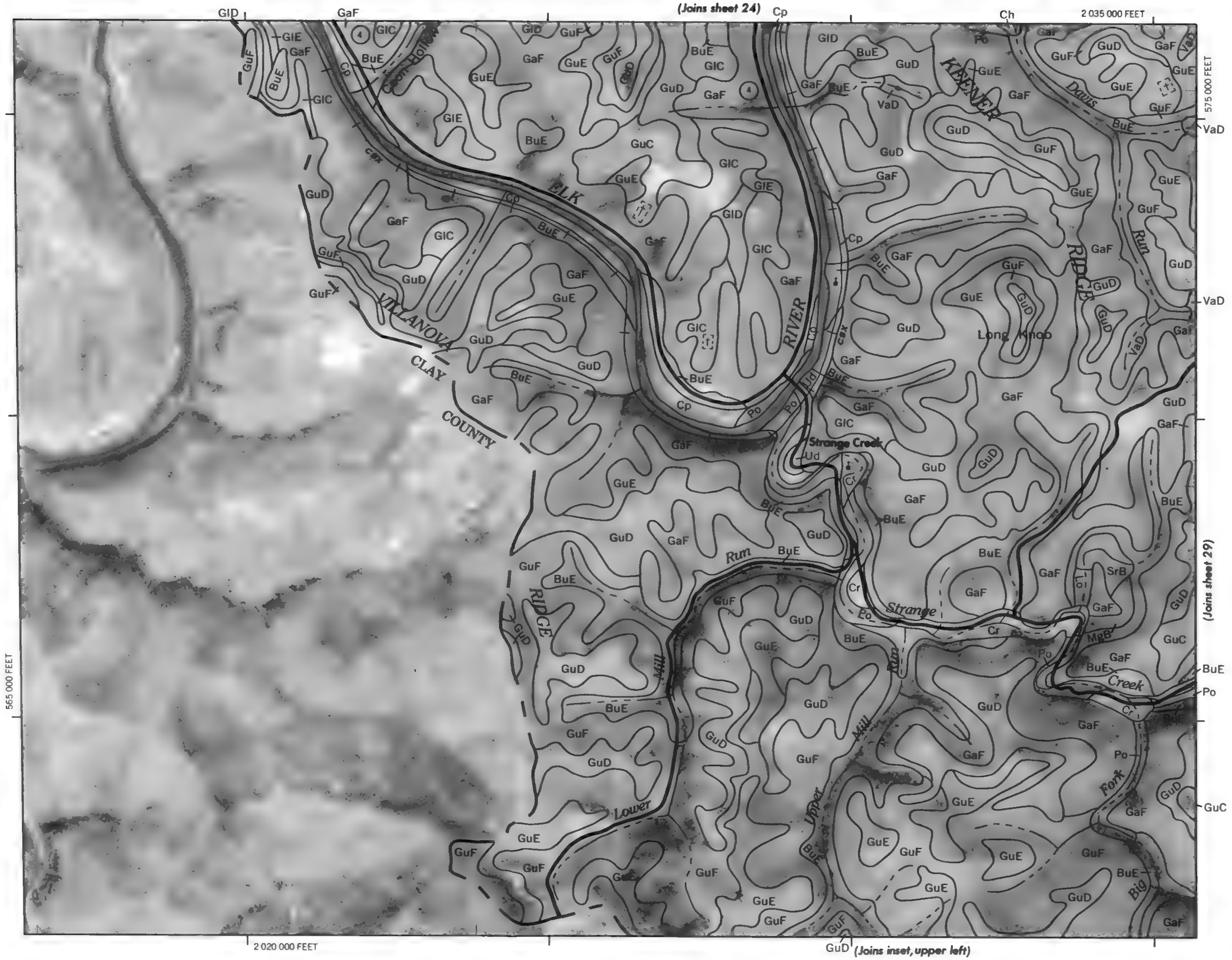


28

N

INSET





1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 28

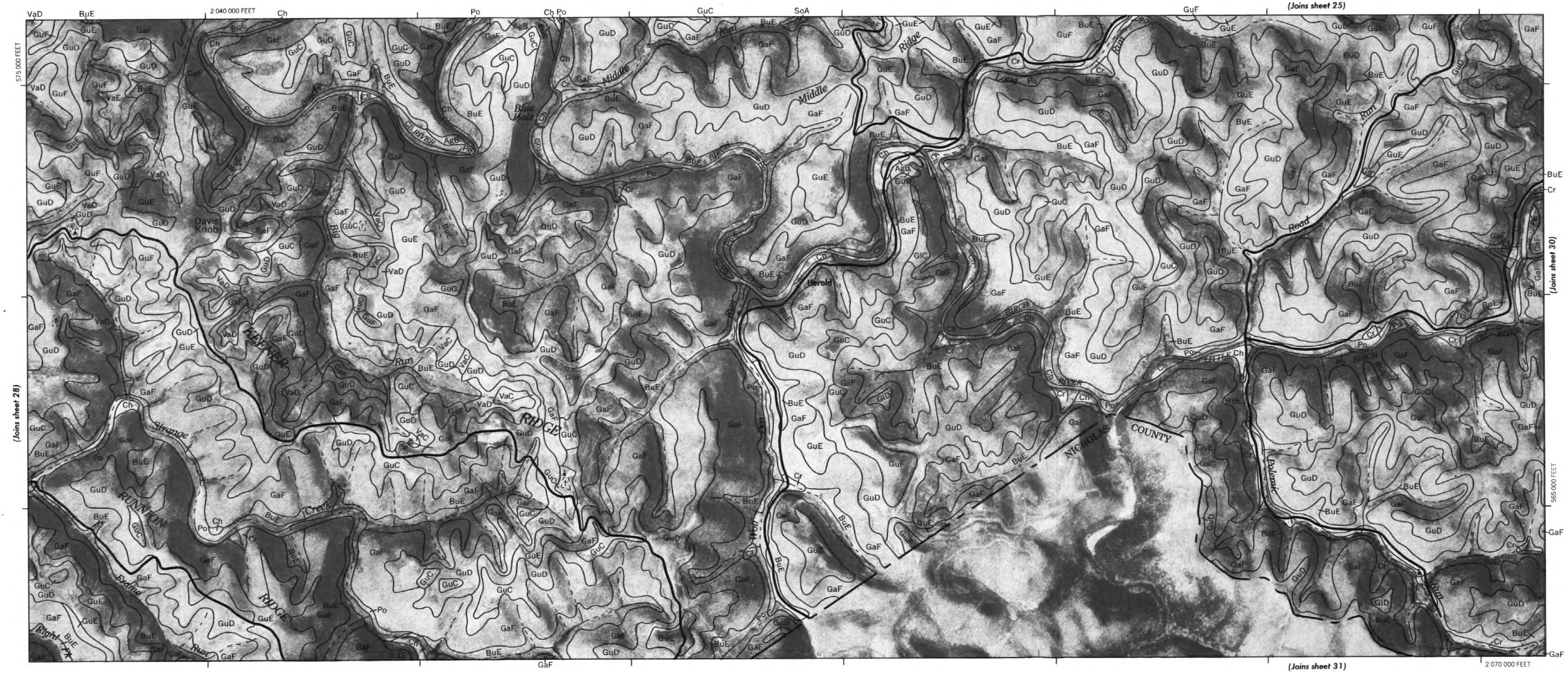
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

29

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA NO. 29



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA — SHEET NUMBER 30

30

N

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

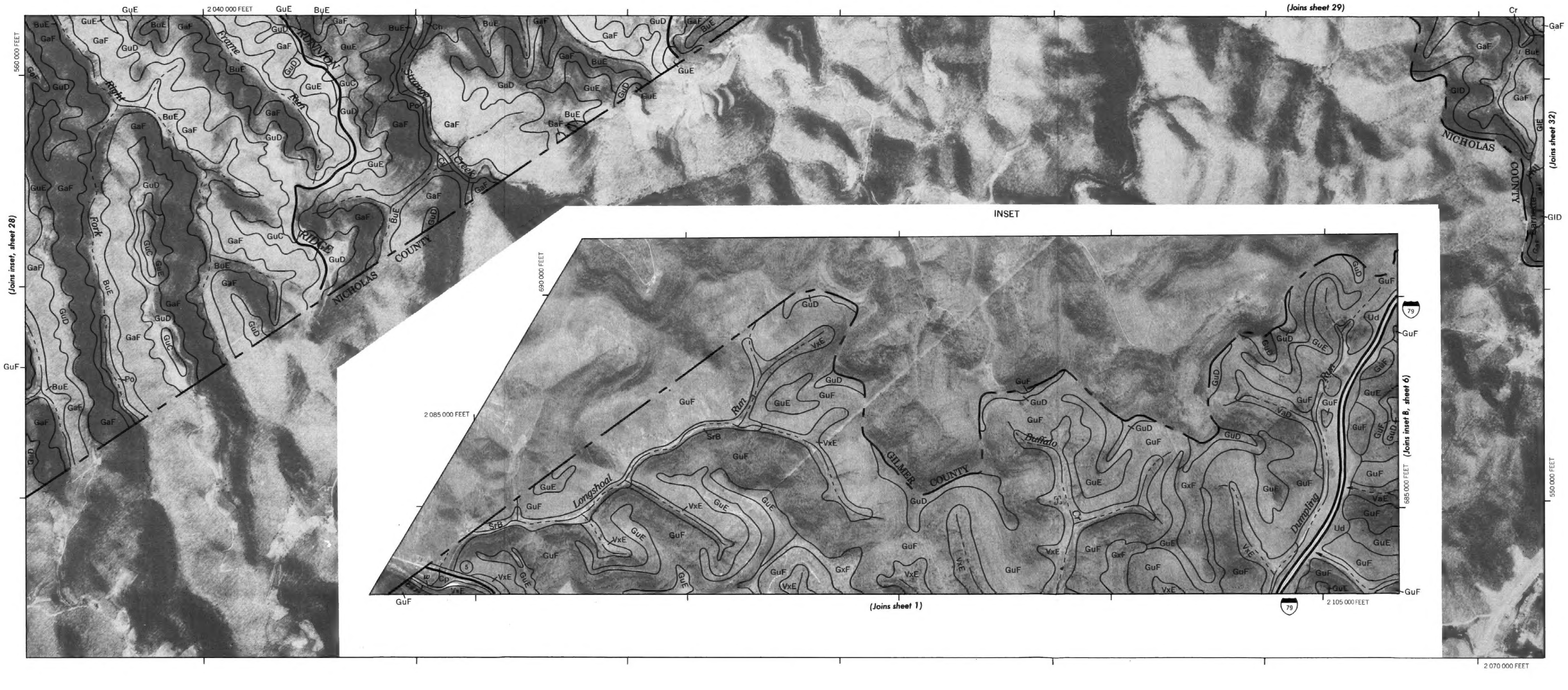
Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 30

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

31

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

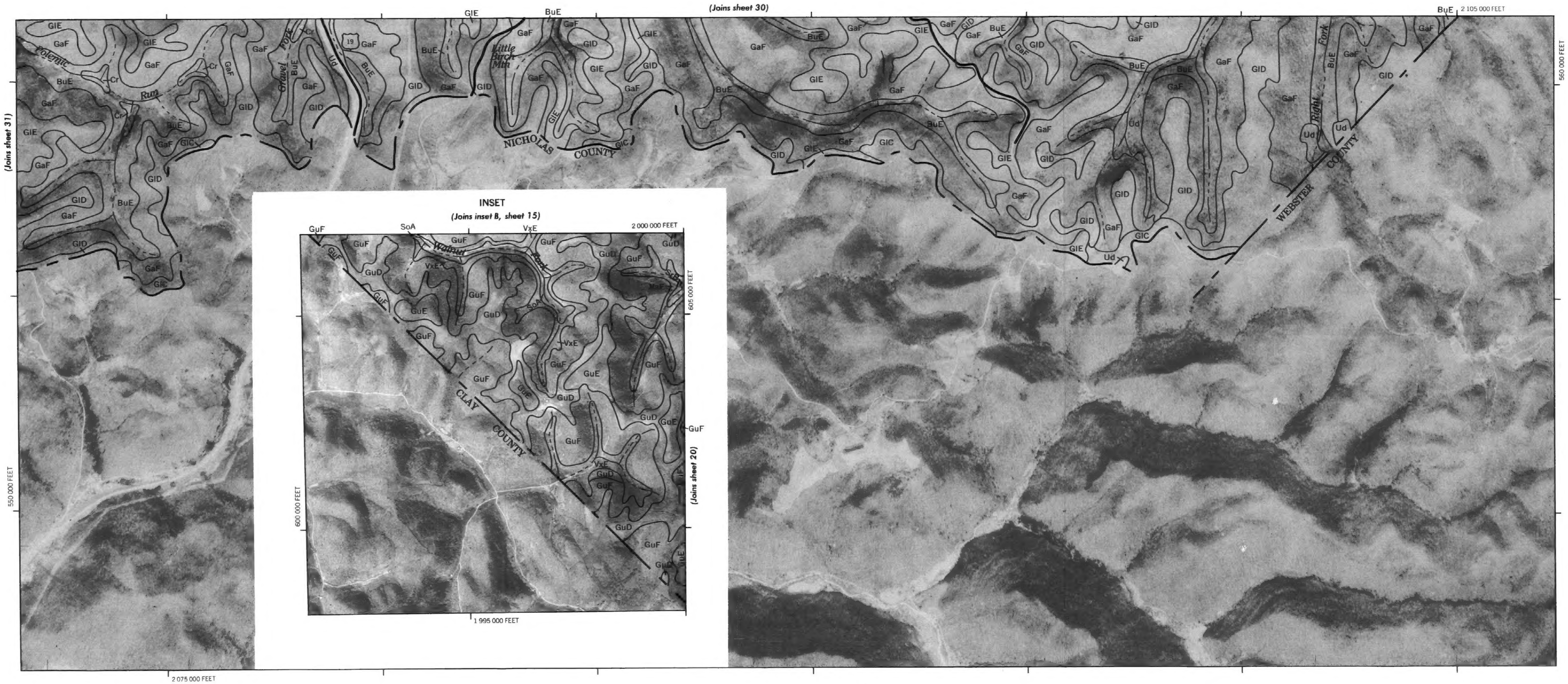
Scale 1:24000

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BRAXTON COUNTY, WEST VIRGINIA NO. 31

32

N



1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

BRAXTON COUNTY, WEST VIRGINIA NO. 32

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1976 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.